Gaboury, M.N. 1984.

Fish Stock Assessment of Simonhouse, First Cranberry, Second Cranberry, Third Cranberry and Elbow Lakes.

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ABSTRACT

Experimental net CPUE of walleye were similar in Simonhouse and the Cranberry lakes, and lower than for Elbow Lake. Except for Second Cranberry Lake, CPUE of pike was higher than for walleye. Low net catches of pike and walleye in Simonhouse and the Cranberry lakes substantiated reports by lodgeowners and anglers that angler success is presently low for these species. A review of previous fisheries surveys of Simonhouse and the Cranberry lakes indicated that since 1968 angler success for walleye and pike had declined. From 1976 to 1981 abundances of walleye have stabilized in the Cranberry lakes and declined in Simonhouse Lake, while pike abundances have increased It is believed that continued harvesting at the present level of angler exploitation will at best maintain the moderate quality angling on Simonhouse and the Cranberry lakes. A pronounced shift in angler exploitation pressure to the higher quality angling in Elbow Lake would decrease significantly the abundance of Elbow Lake walleye and pike.

There was an apparent relationship between total precipitation and air temperatures, and walleye year class strengths. Year class strength appeared to be more dependent on precipitation than temperature, although temperatures appeared to be important in years with low precipitation.

To maintain the relatively high success rates for walleye and pike in Elbow Lake, and assist in developing a conservation management strategy, an estimation of annual angler yield and future experimental gill netting are recommended.

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INTRODUCTION

Fisheries surveys of Simonhouse, First Cranberry, Second Cranberry and Elbow Lakes were undertaken in 1980 and/or 1981. Biological assessment of the fish populations was done to provide information for the management of commercial net and sport fisheries on these lakes.

The study lakes are heavily exploited by anglers, operating from two commercial lodges at First Cranberry Lake, two at Elbow Lake, and to some extent from seven lodges on Lake Athapapuskow. Since 1970, angler success for walleye and to a lesser extent pike has decreased on Simonhouse and the Cranberry lakes (P. Rod, Man. Dept. Nat. Res., and T. Smith, Viking Lodge owner pers. comm.). Anglers still exploit walleye in these areas in spring but between mid-June and September anglers often travel to Wedge and Brunne lakes, adjacent to Third Cranberry Lake, as well as Elbow Lake, where angling success for walleye is higher (T. Smith pers. comm.).

Simonhouse Lake was commercially netted from 1931 to 1967 with an average winter production of 14,500 kg (32,000 lbs) (Appendix 1). Species composition of the commercial catch was 47% whitefish (Coregonus clupeaformis), 35% pike (Esox lucius), 15% walleye (Stizostedion vitreum vitreum), 2% lake trout (Salvelinus namaycush), and 1% cisco (Coregonus artedii) and white sucker (Catostomus commersoni) (Peters and Wall 1980). Recently (1983) a fall trap net fishery was initiated to harvest cutter whitefish on their spawning grounds in Simonhouse Lake.

Previous Investigations

Stewart-Hay (1956) did a brief biological survey of Second Cranberry Lake in 1953. Only one net (7.0cm mesh(stretched measure), 91m long and 1.8m deep) was set and 37 walleye, 20 cisco, 4 whitefish, 4 pike, 3 white sucker, 1 lake trout and 1 burbot (Lota lota) were caught.

Experimental gill netting was conducted on First Cranberry Lake from February 4 to 11, 1966 to determine if netting could be selective enough to harvest primarily non-game fish (Allard and Schlick 1966). The rough fish were to be utilized by a local mink rancher. A standard gang of gill nets were used consisting of 6 mesh sizes: 5.1, 7.6, 9.5, 10.8, 12.1 and 13.3 cm. Each gill net was 45.7m long and 1.8m deep, and set duration was from 2 to 4 nights. Six standard gangs were set and out of a total of 965 fish caught the relative proportions were 2% walleye, 12% pike, 4% lake trout, 26% whitefish, 45% cisco, 5% burbot, 6% white sucker and 0.3% yellow perch (Perca flavescens). It was concluded that selective harvesting of rough fish by gill nets was ineffective because of the high percentage of game fish removed.

Rough fish removal on First Cranberry Lake was tried again in 1970 at the request of the sport fish lodge owners (Man. Fisheries Branch memo). The lodge owners believed that removal of the rough fish would reduce natural forage fish abundance, increasing the likelihood of game fish taking the angler's bait. As in 1933 similar proportions of rough (~67%) vs game (~33%) fish were caught, and the program was discontinued.

Voluntary and interview creel censuses on the Cranberry lakes were done from June to September in 1957 and 1958. Angler success for walleye ranged from 0.09 to 1.70 fish · hour^{-1}, while CPUE for pike ranged from 0.38 to 1.93, and for lake trout from 0.01 to 1.59 (Man. Fisheries Branch memo). Generally angler success for each species improved from June to September.

A voluntary and interview creel census was also done from May 17 to July 15, 1976 on the Cranberry lakes (Scaife 1977(a)). Angler success for walleye ranged from 0.09 to 0.31 fish · hour^{-1}, while CPUE for pike ranged from 0.35 to 1.01, and lake trout from 0.01 to 0.02. From May to July angler success for walleye and pike increased but decreased slightly for lake trout.

Experimental netting was done in 1975 and 1976 on First, Second and Third Cranberry lakes (Scaife 1977(b)), and in 1976 on Simonhouse Lake (Man. Fisheries Branch unpub. data). The studies were undertaken because of concerns raised by lodge owners that angler catches of particularly walleye had decreased dramatically. The objective of the study was to provide baseline information on the relative and absolute abundances of all fish species in the four lakes. A minimum of two standard gangs of nets per lake were set in each year in the Cranberry lakes, and eight gangs were set in Simonhouse Lake. In 1975 each standard gang consisted of five nets with mesh sizes: 7.6, 9.5, 10.8, 12.1, and 13.3cm. In 1976, a 3.8cm mesh net was added to the standard gang. Each gill net was 45.7m long and 1.8m deep. Catches from these surveys will be discussed in detail in the Discussion.

MATERIALS AND METHODS

Lake Morphometry

Elbow Lake was depth sounded with a Furuno FG 200 MK3 echo sounder with a range of 0 to 87 meters. The unit was attached to a 4.3m inflatable boat powered by a 20 horsepower outboard motor. Sounding transects were drawn in the field on a 1:50,000 scale topographic map, and later transferred to a 1:20,000 scale photobase mosaic of Elbow Lake. Morphometric maps for Simonhouse and the Cranberry lakes had been drawn previously and the depth contours were verified with soundings made in 1980. The bathmetric maps were used to determine lake area and volume, shoreline development and mean depth, according to procedures described by Hutchinson (1975).

Physical and Chemical Water Quality

Chemical analysis of the water samples (2.5 l) was performed within 48 h by the Technical Services Laboratory, Manitoba, Department of Environment and Workplace Safety and Health.

Field measurements of water quality included water temperatures, oxygen and conductivity profiles, pH, and transparency determinations. Temperature, oxygen and conductivity were determined with YSI electronic instruments, and transparency was estimated using a Secchi disc (20 cm diameter). The pH was measured with a Hach wide range comparator field kit.

Plankton

At each station, two plankton samples were collected by vertical tows of a Wisconsin plankton net with an opening diameter of 25 cm and a mesh size of 73 µm. One sample was preserved in Lugol's solution and the other in 10% formalin. Plankton samples were also collected from areas of emergent vegetation with a long handle plankton sweep net of 73 µm mesh and preserved in 10% formalin. Species identification of the plankton had not been performed at the time of this writing.

Benthos

One benthos sample was collected at each station with a 15 x 15 cm Ekman dredge. Samples were washed immediately using a 400 µm Nitex bag and then preserved in 10% formalin. Organisms had not been identified at the time of this writing.

Experimental Fishing

Fish were collected with a standard gang of gill nets, each gang consisting of six nets with mesh sizes, arranged in the following order: 3.8, 9.5, 5.1, 10.8, 7.6 and 12.7. Each gill net was 22.9 m long and 1.8 m deep. Gangs were set overnight for approximately 16 h. Efforts were made to sample a variety of habitat areas within the lake.

Whitefish, walleye, pike and lake trout were sampled for fork length, weight, sex, maturity and stomach contents. All other fish species were sampled for fork length and weight only. For age determination, otoliths and the first two dorsal spines were taken

from walleyes, and otoliths and the first two pelvic rays were taken from whitefish and lake trout. From pike, cleithra and the first two pelvic fin rays were taken for ageing. Otoliths were prepared and aged according to the procedures described by Erickson (1979). Cleithra were cleansed of skin and aged using an illuminated magnifying glass. The other structures were not aged at this time.

Forage Fish Collection

Small fish specimens were collected using Noxfish*, a 5% emulsifiable rotenone. In small, shallow bays of the lakes, Noxfish was gradually dispensed into the outboard propellor wash and thoroughly mixed into the water by traversing the treated area by boat several times. The affected fish were recovered using dip nets.

Calculations

Procedures described by Snedecor and Cochran (1967) were followed for statistical analyses. Annual survival rates were computed according to Robson and Chapman (1961). Survival rate estimates were made on the combined catches in 1980 and 1981, and the catch curves were based on the total number of fish in each age class rather than in each year class. The morphoedaphic index(MEI) was calculated according to Ryder's (1965) formula.

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* Available from S. B. Penick & Co., 100 Church Street, New York, N.Y., U.S.A.

Maturity rate and age at maturity for walleye and pike were based on a logistic model described by Lysack (1980). The equation for this model is:

$$Y_x = \frac{K}{1 + e^{-b(x - x_o)}}$$

where Y_x = frequency of mature fish among all fish aged X

K = frequency of mature fish among the oldest age groups (assume K = 100%)

X_o = age at inflection point. (i.e. age of maturity)

b = slope

This equation was transformed to the linear regression form of:

$$-\log_e \frac{K - Y_x}{Y_x} = bx_o - bx$$

This is a corrected version of the original transformation by Lysack (1980).

The mean weighted age at onset of sexual maturity (Z) was calculated by the equation:

$$Z = \frac{A_1K_1 + A_2(K_2 - K_1) + A_3(K_3 - K_2) + \ldots A_n(K_n - K_{n-1})}{K_1 + (K_2 - K_1) + (K_3 - K_2) + \ldots (K_n - K_{n-1})}$$

where A = age (years)

K_n = % of mature fish in the n^{th} age class

This is a corrected form of Abrasov's (1967) original formula.

Fish growth was described by von Bertalanffy's (1938) equation:

$$l_t = L_\infty (1 - e^{-k(t - t_o)})$$

where l_t = length (mm) at age t (years)

L_∞ = asymototic length (mm)

k = rate of decrease in length increments

t_o = hypothetical age (years) at which the fish's length was zero

Asympototic length (L_∞) was determined from the plot l_{t+1} vs l_t, as described by Walford (1946). L_∞ is the length at which the Walford line intersects a 45^o diagonal from the origin. The growth coefficient (k) was described by Brody (1927) and was the slope of the plot of $\log_e (L_\infty - l_t)$ vs t. The parameter t_o was calculated by the formula:

$$t_o = \frac{\log_e \frac{c}{L_\infty}}{k}$$

where c = length (mm) at age zero, based on the Brody plot.

RESULTS

Lake Morphometry

Mean water depth was between 5 and 6 m in Simonhouse, Elbow and First and Third Cranberry lakes, and much shallower than Second Cranberry lake with a mean depth of 22 m (Table 1, Figs. 1, 3, 5, 7 and 9). Simonhouse is the largest lake with a net water area of 8198 ha while Third Cranberry Lake is the smallest at 1008 ha. Elbow Lake has the highest shoreline development index due to its convoluted shoreline and many islands.

Table 1. Morphometric data for study lakes.

Parameter	Simonhouse	First Cranberry	Second Cranberry	Third Cranberry	Elbow
Net water area (ha)	8198	1341	1708	1008	3218
Maximum depth (m)	19.2	11.0	52.1	14.0	17.5
Mean depth (m)	5.0	5.9	22.3	5.3	5.6
Net water volume (x $10^7 m^3$)	40.70	7.93	38.2	5.33	17.9
Length of mainland shoreline (km)	117.3	38.0	50.0	48.9	103.3
Length of island shoreline (km)	24.1	13.7	24.0	13.6	72.6
Total length of shoreline (km)	141.4	51.7	74.0	62.5	175.9
Shoreline development index	4.4	4.0	5.0	5.6	17.49

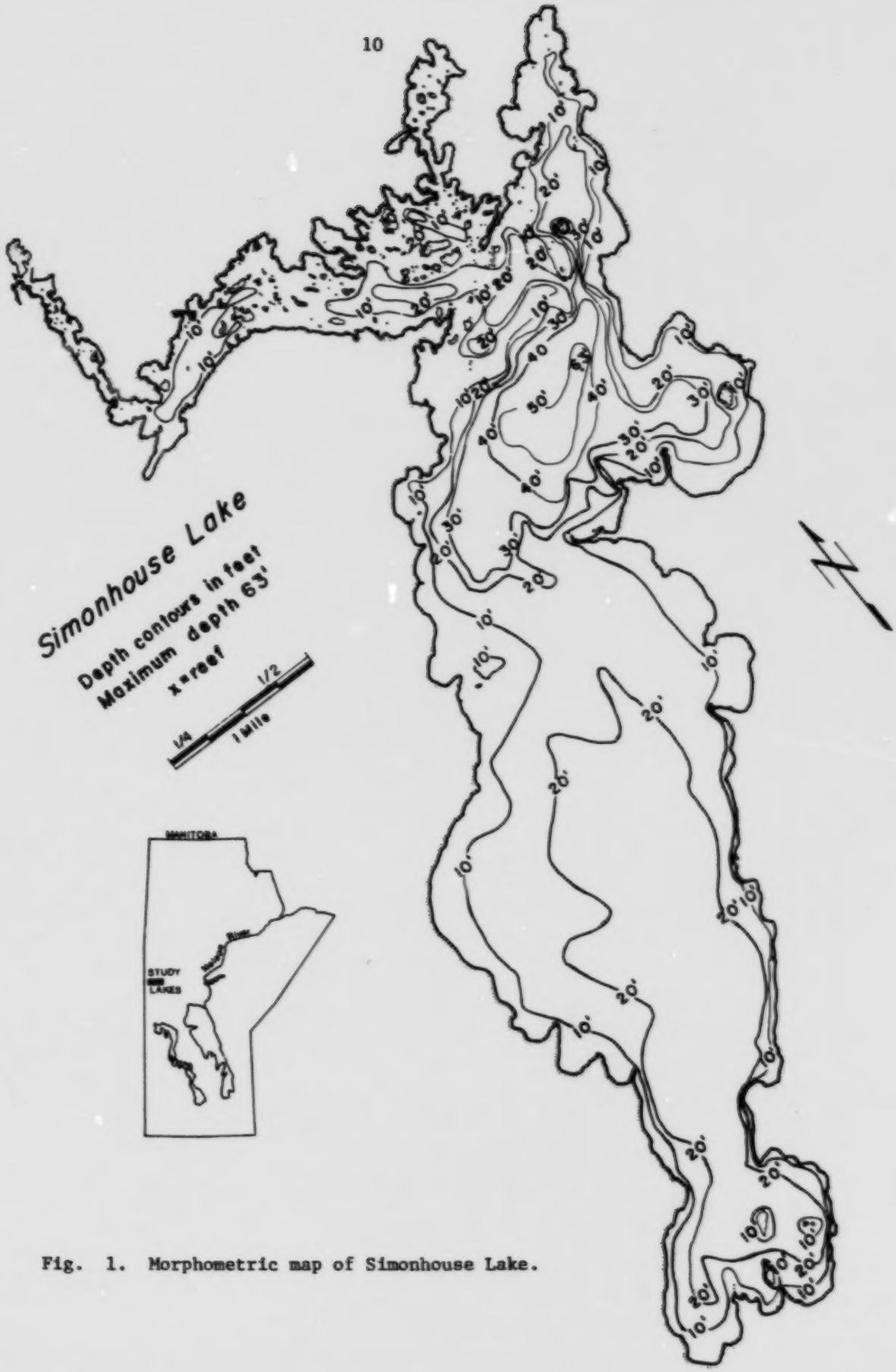
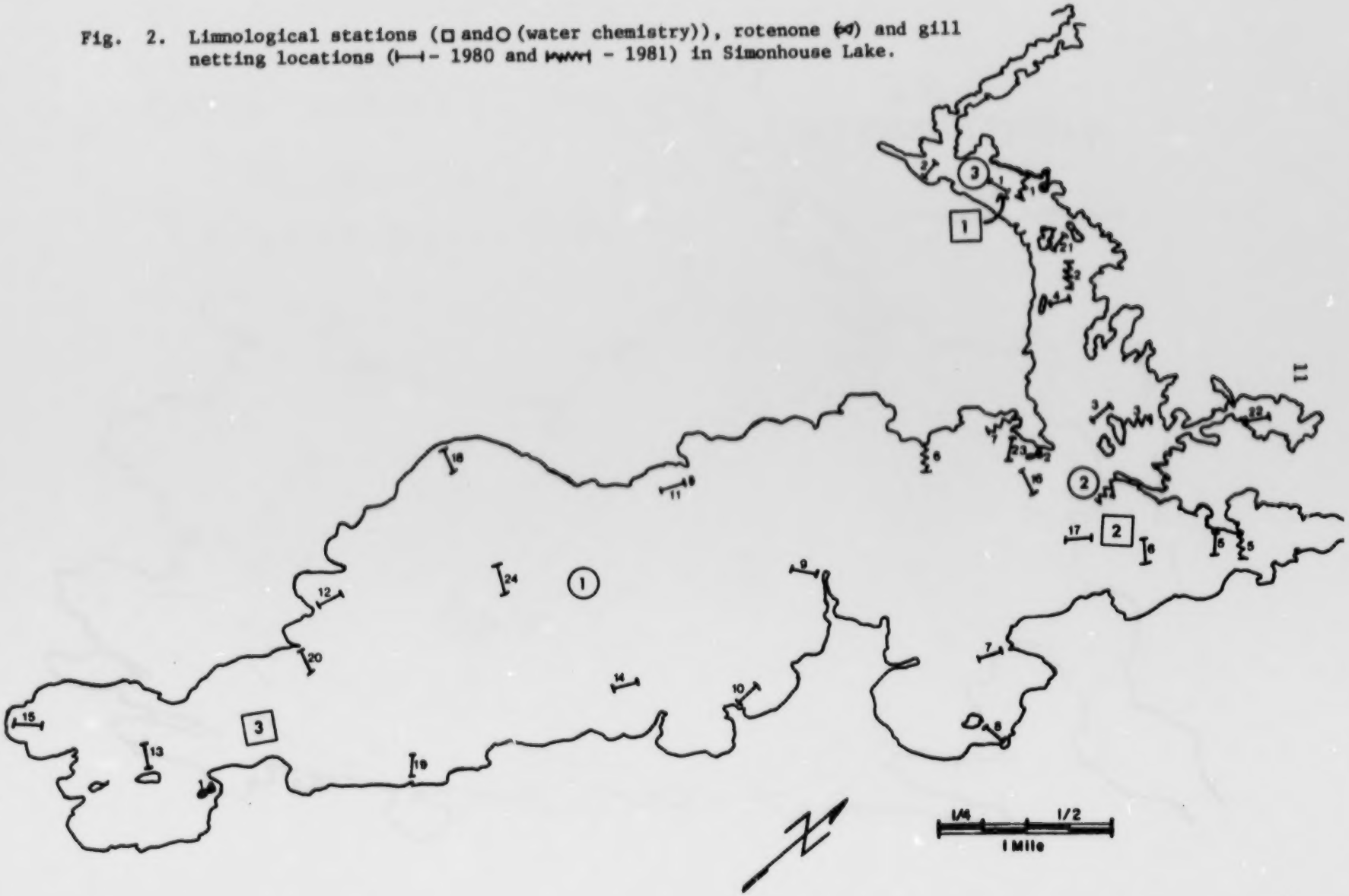


Fig. 1. Morphometric map of Simonhouse Lake.

Fig. 2. Limnological stations (□ and○ (water chemistry)), rotenone (⊠) and gill netting locations (⊢⊣ - 1980 and ⊢∿⊣ - 1981) in Simonhouse Lake.



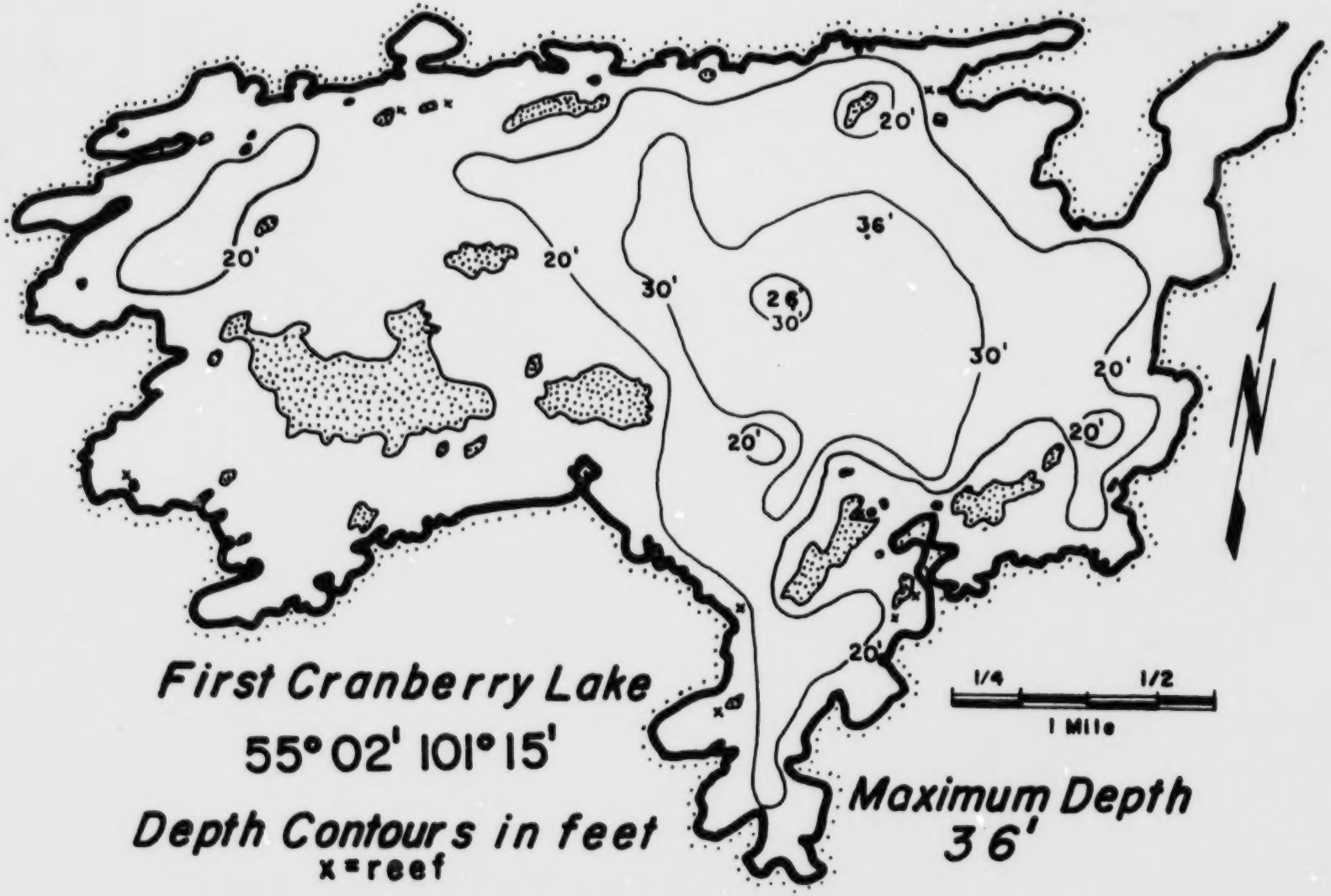


Fig. 3. Morphometric map of First Cranberry Lake.

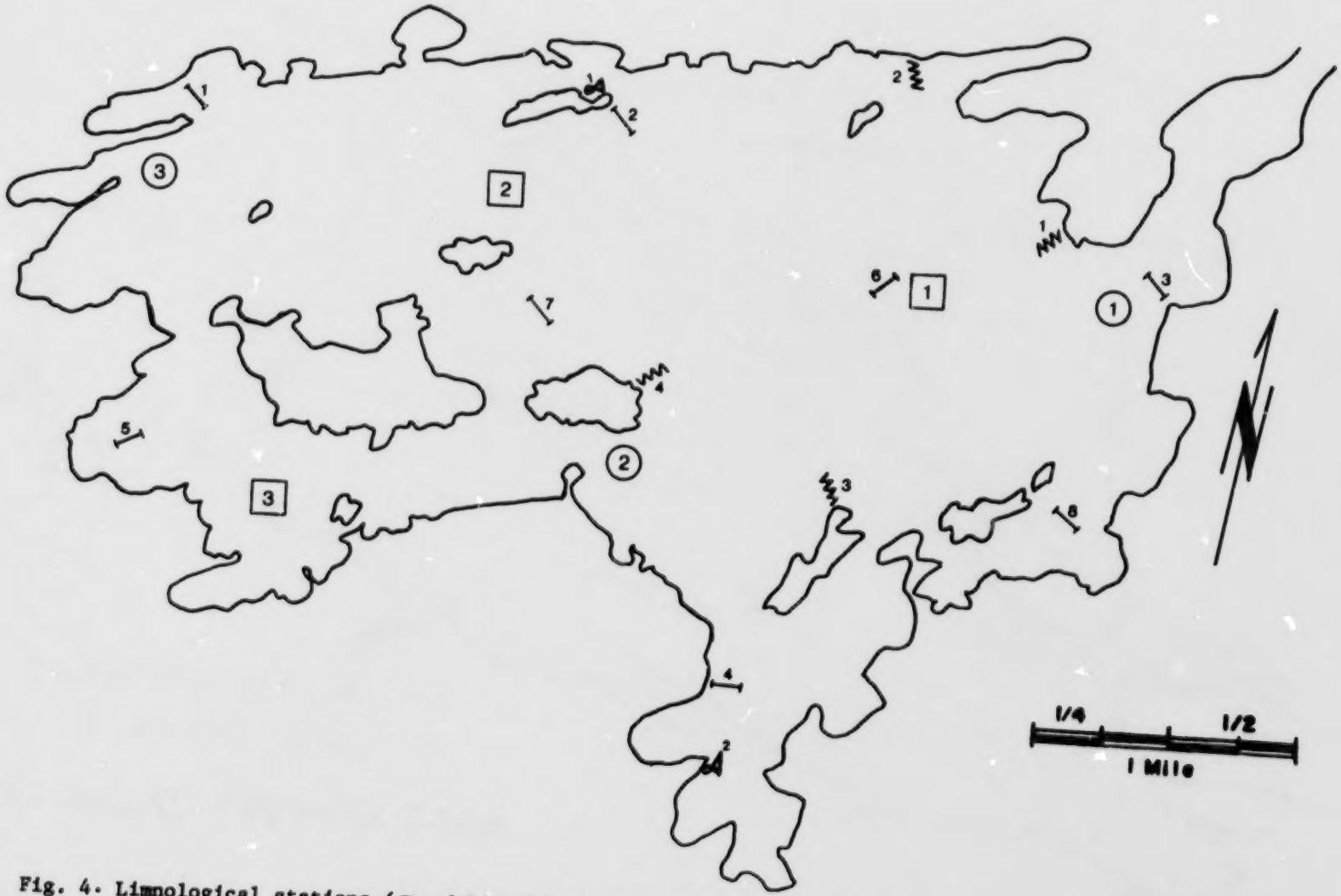


Fig. 4. Limnological stations (□ and O(water chemistry)), rotenone (⟷), and gill netting locations (⟷ - 1980 and ⟷ - 1981) in First Cranberry Lake.

Fig. 5. Morphometric map of Second Cranberry Lake.

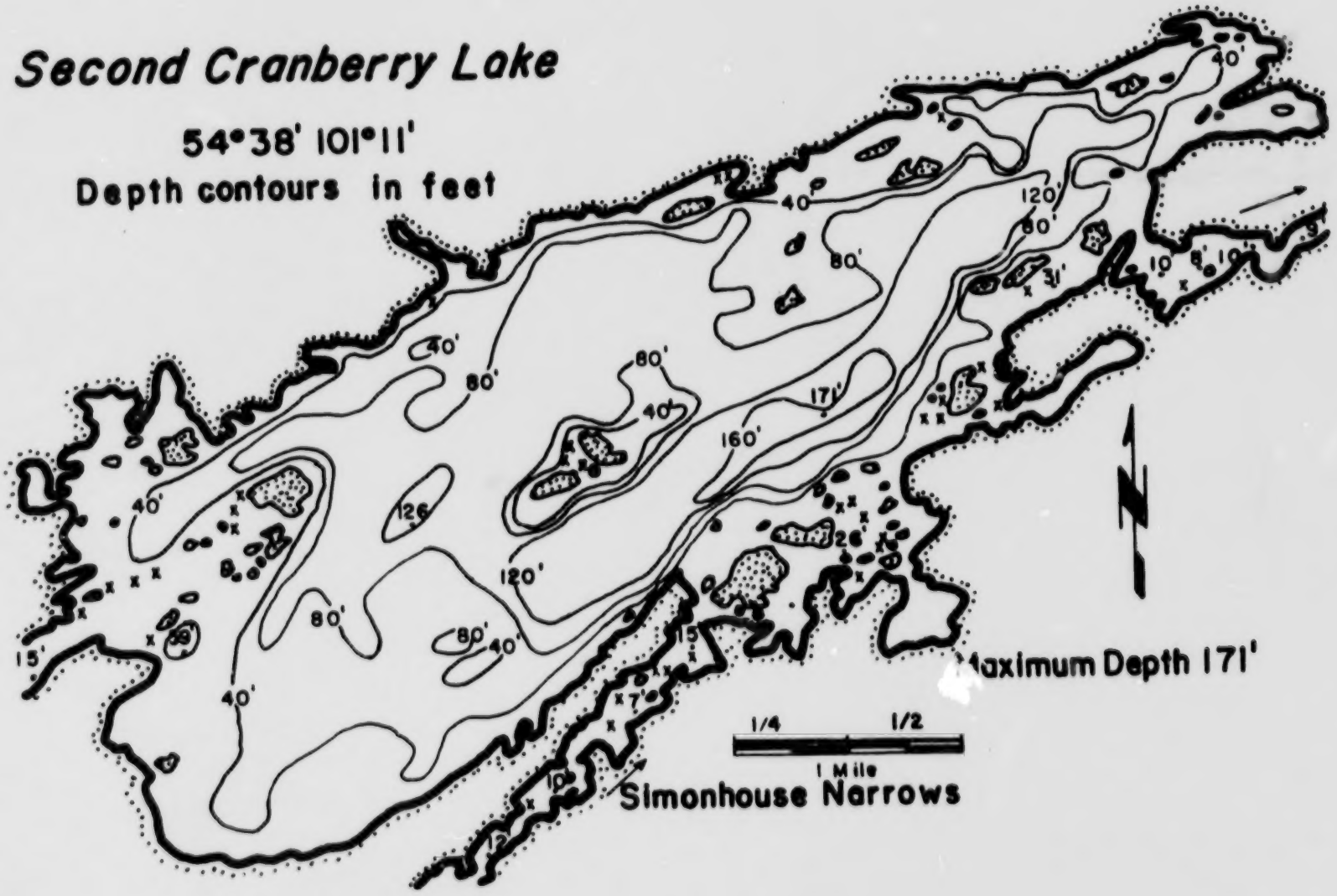


Fig. 6. Limnological stations (□ and ○(water chemistry)), rotenone (⊲), and gill netting locations (⊢⊣ - 1980 and ⊢∿∿⊣ - 1981) in Second Cranberry Lake.

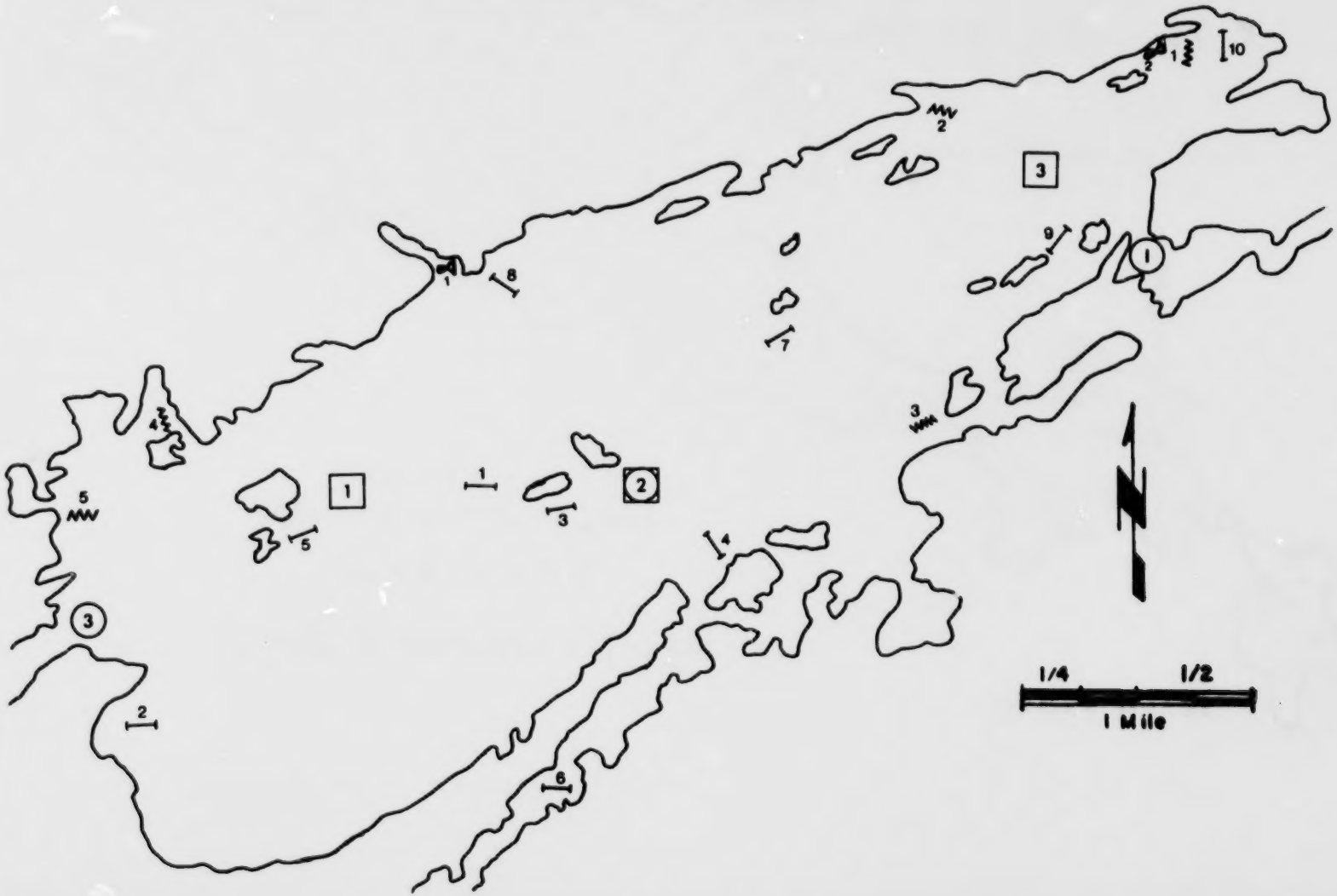


Fig. 7. Morphometric map of Third Cranberry Lake.

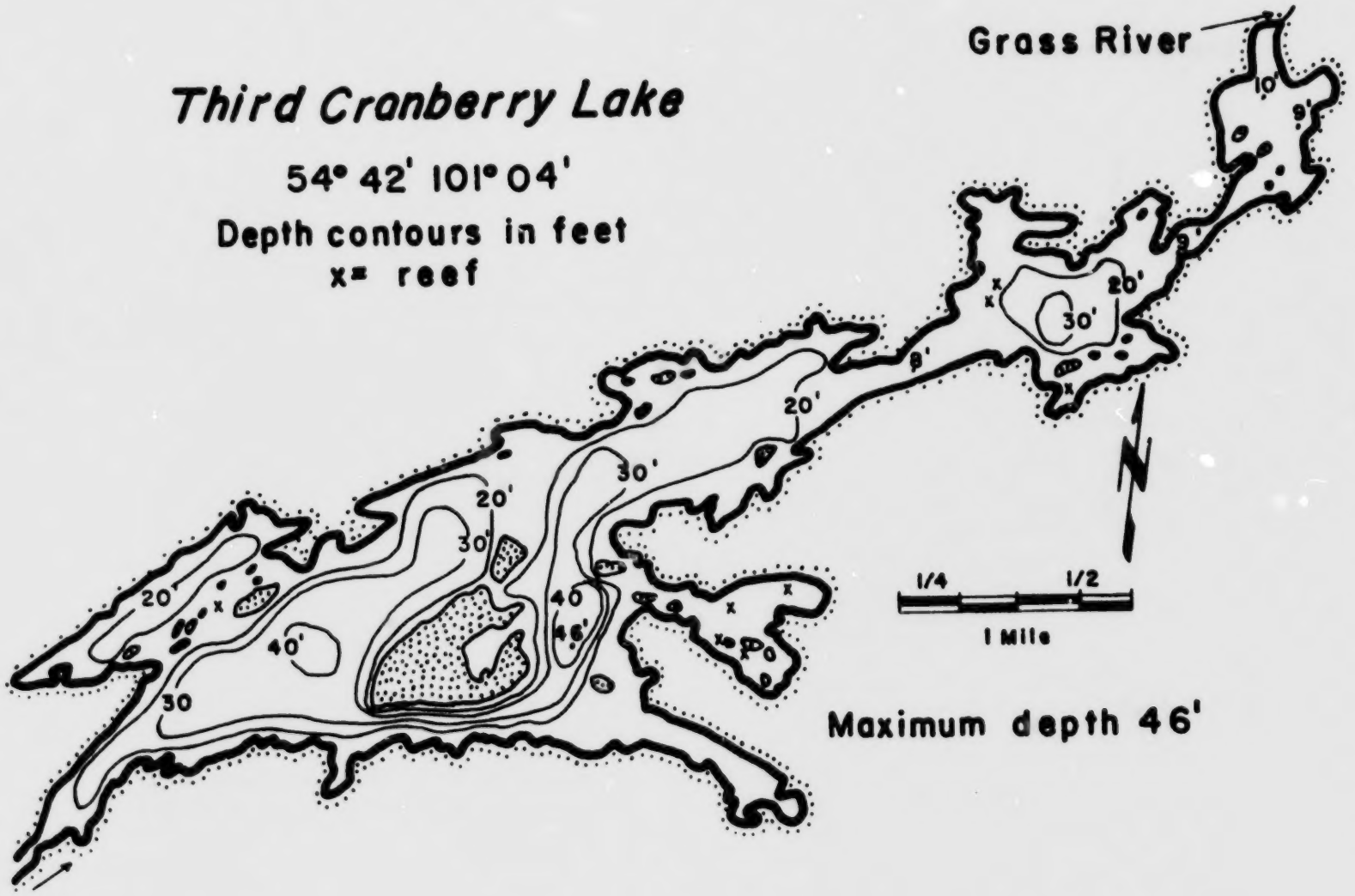
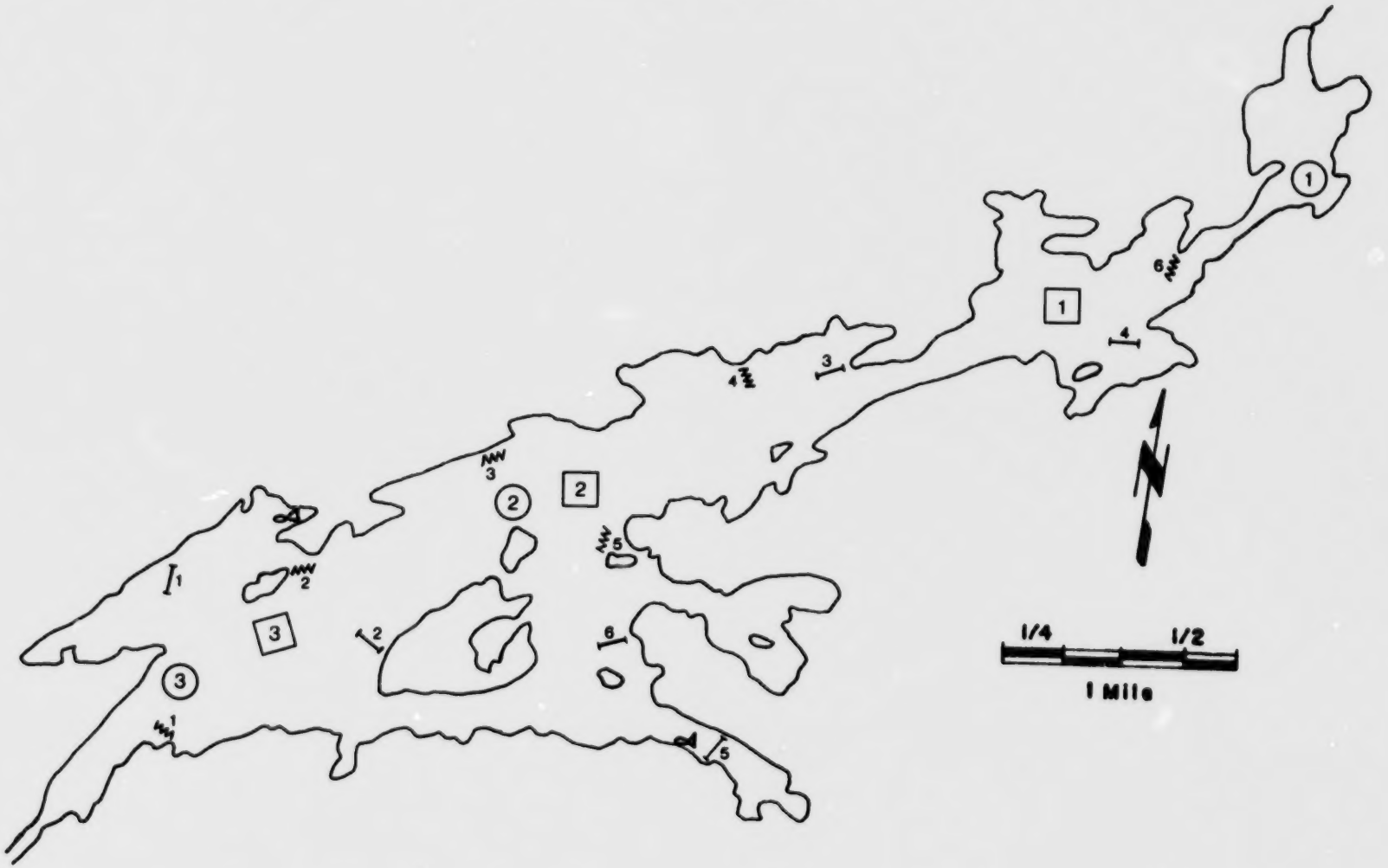


Fig. 8. Limnological stations (□ and ○(water chemistry)), rotenone (⌀), and gill netting locations (⊢⊣ - 1980 and ⊢WWW⊣ - 1981) in Third Cranberry Lake.



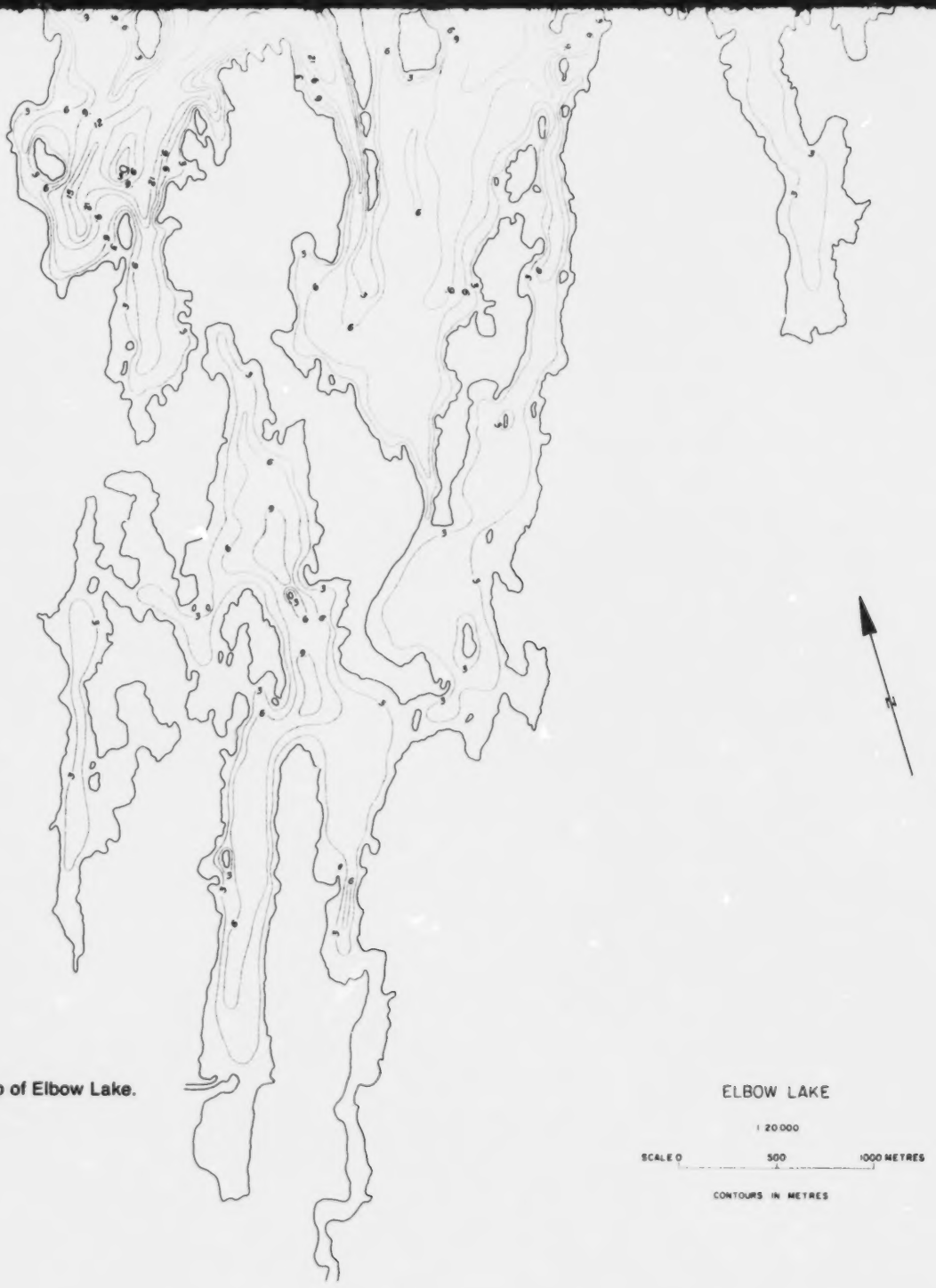


Figure 9. Morphometric map of Elbow Lake.

Fig. 10. Limnological stations (□ and ○ (water chemistry)), rotenone (~~~), and gill netting locations (wwww) in Elbow Lake, 1981.

Physicochemical Water Quality

Chemical analyses of water samples indicated mean conductivities, TDS, total inorganic carbon, and other parameters decreased from Simonhouse downstream through the Cranberries to Elbow Lake (Table 2, Figs. 2, 4, 6, 8 and 10, Appendices 2 and 3). Total phosphorous and dissolved nitrogen concentrations, however, were higher in Elbow than in the other lakes.

Field conductivities were lower than the conductivities of the water samples determined by the Technical Services Branch (Table 3). However, the decreasing trend in conductivity from Simonhouse Lake to Elbow Lake was evident also in field measurements. Second Cranberry was the deepest lake with the highest Secchi disc transparency (5.0 m) and a distinct thermocline. The other lakes were isothermal and had Secchi disc transparencies between 1.7 and 3.2 m. Surface and bottom dissolved oxygen concentrations were generally higher than 7.5 ppm, except near the bottoms of Second Cranberry (5.5 to 6.1 ppm) and Third Cranberry (4.0 to 4.5 ppm) lakes.

Fisheries

Species Composition and Catch per Unit of Effort - Cisco was the most abundant species in four of the five lakes, with pike being more abundant than walleye in all lakes except Second Cranberry Lake (Tables 4 and 5; Appendices 4 to 9).

Table 2. Water chemistry analyses of study lakes, as means of values from three water samples taken from each lake, Appendices 2 and 3.

Parameter	Simonhouse	First Cranberry	Second Cranberry	Third Cranberry	Elbow
Conductivity ($\mu mho \cdot cm^{-1}$)	285.	206.	206.	192.	97.
Total dissolved solids ($mg \cdot l^{-1}$)	177.	137.	123.	123.	66.
Total suspended solids ($mg \cdot l^{-1}$)	< 5.	< 5.	< 5.	< 5.	<5.
Hardness ($CaCO_3$) ($mg \cdot l^{-1}$)	160.	102.	104.	102.	33.
Total alkalinity ($CaCO_3$) ($mg \cdot l^{-1}$)	155.	103.	109.	100.	44.
pH	8.55	8.47	8.36	8.43	7.72
Ca - extractable ($mg \cdot l^{-1}$)	29.	19.	20.	19.	8.
Mg - extractable ($mg \cdot l^{-1}$)	21.	13.	13.	13.	<5.
K - extractable ($mg \cdot l^{-1}$)	< 2.1	< 2.	< 2.	< 2.	<2.0
Na - extractable ($mg \cdot l^{-1}$)	<10.0	<10.	<10.	<10.	<10.
Total organic carbon ($mg \cdot l^{-1}$)	13.7	14.7	13.7	14.7	14.2
Total inorganic carbon ($mg \cdot l^{-1}$)	35.7	24.3	24.7	22.5	9.8
$NO_3 - NO_2 - N$ - dissolved ($mg \cdot l^{-1}$)	< 0.01	< 0.01	< 0.01	< 0.01	0.03
P - total ($mg \cdot l^{-1}$)	< 0.02	0.02	< 0.02	0.02	0.05
Cl - soluble ($mg \cdot l^{-1}$)	< 1.2	< 1.3	< 1.0	< 1.0	<2.0
SO_4 - soluble ($mg \cdot l^{-1}$)	5.0	5.0	5.0	5.0	10.0
Colour	< 5.0	< 5.0	< 5.0	< 5.0	16.7
Turbidity (NTU)	1.5	1.2	0.57	1.2	1.5

Table 3. Physicochemical field measurements in the study lakes.

Lake	Date	Station Water Depth (m)	Temperature (°C) Surface	Temperature (°C) Bottom	Thermocline (m)	Dissolved Oxygen (ppm) Surface	Dissolved Oxygen (ppm) Bottom	Surface Conductivity ($\mu mhoe \cdot cm^{-1}$)	Secchi (m)	pH
Simonhouse	June 17/80	5	18.0	17.3	-	11.2	10.4	230	3.2	7.9
	June 18/80	3	16.5	15.9	-	10.2	10.2	245	3.0	7.8
	June 18/80	7	18.6	15.9	-	10.9	10.2	253	2.8	7.8
First Cranberry	Aug. 9/80	9	19.2	17.9	-	9.0	7.5	180	1.7	>8.5
	Aug. 9/80	7	20.5	17.9	-	9.0	5.8	190	1.7	>8.5
	Aug. 9/80	3	20.1	18.0	-	8.1	8.2	195	1.7	>8.5
Second Cranberry	Aug. 23/80	34	17.2	6.5	15.0	8.0	5.5	170	5.0	8.5
	Aug. 23/80	39	16.5	6.0	14.5	8.0	6.1	170	5.0	8.5
	Aug. 24/80	39	16.4	6.1	16.0	8.3	5.8	170	5.0	8.5
Third Cranberry	Aug. 17/80	8	19.2	17.5	-	8.1	4.0	170	2.0	7.9
	Aug. 17/80	9	19.2	17.9	-	8.3	4.5	170	2.2	8.0
	Aug. 17/80	12	19.0	17.0	-	8.0	4.0	170	2.2	8.0
Elbow	May 28/81	8	14.9	8.9	-	10.0	8.2	60	2.5	7.6
	May 30/81	5	13.5	12.0	-	9.0	8.4	55	2.7	7.4
	June 4/81	4	17.0	15.1	-	8.4	7.8	90	1.7	7.6

Table 4. Percent composition and catch per unit of effort (number·stand.gang^{-1}· 16 h^{-1}, in parentheses) for fish caught in the study lakes in 1980 and/or 1981.

Species	Simonhouse			First Cranberry			Second Cranberry			Third Cranberry			Elbow
	1980	1981	1980+81	1980	1981	1980+81	1980	1981	1980+81	1980	1981	1980+81	1981
Whitefish	10.2	12.3	10.9(5.2)	0.3	5.3	2.5(1.3)	22.3	31.1	24.4(7.3)	10.2	22.1	16.8(11.7)	8.3(6.0)
Cisco	16.9	4.2	12.6(6.0)	45.0	29.1	37.8(20.0)	37.4	9.4	30.8(9.3)	66.0	43.7	53.6(37.4)	37.0(26.9)
Lake trout	-	-	-	-	0.3	0.2(0.08)	4.9	3.8	4.7(1.4)	-	0.6	0.4(0.2)	0.07(0.05)
Pike	27.2	23.5	25.9(12.3)	8.6	20.0	13.7(7.2)	4.9	1.9	4.2(1.3)	3.0	11.6	7.8(5.4)	19.9(14.4)
Walleye	8.9	12.1	10.0(4.7)	8.0	8.8	8.4(4.4)	12.2	-	9.3(2.8)	10.8	0.9	5.2(3.7)	17.6(12.8)
Yellow perch	3.6	3.2	3.5(1.6)	26.9	18.2	23.0(12.2)	-	-	- -	6.7	3.6	5.0(3.5)	4.0(2.9)
Burbot	0.3	0.2	0.3(0.1)	-	1.7	0.8(0.4)	1.2	2.8	1.5(0.5)	-	2.1	1.2(0.8)	1.0(0.7)
White sucker	32.9	44.5	36.8(17.5)	11.2	16.5	13.6(7.2)	17.1	50.9	25.1(7.5)	3.2	15.4	10.0(7.0)	12.1(8.8)
No. of standard gangs	24	7	31	8	4	12	10	5	15	6	6	12	20
Total no. of fish	976	497	1473	349	285	634	345	106	451	371	467	838	1453

Table 5. Ranking of species in order of abundance (1- most to 6- least)

Rank	Simonhouse	First	Second	Third	Elbow
1	W. Sucker	Cisco	Cisco	Cisco	Cisco
2	Pike	Perch	W. sucker	Whitefish	Pike
3	Cisco	Pike	Whitefish	W. Sucker	Walleye
4	Whitefish	W. Sucker	Walleye	Pike	W. Sucker
5	Walleye	Walleye	Lake Trout	Walleye	Whitefish
6	Perch	Whitefish	Pike	Perch	Perch

CPUE (number · standard gang $^{-1}$ · 16h^{-1}) of walleye in experimental nets (Figs. 2, 4, 6, 8 and 10) ranged from 2.8 to 12.8, lowest in Second Cranberry Lake and highest in Elbow Lake. CPUE of pike was greater than walleye in most lakes, and ranged from 1.3 in Second Cranberry Lake to 14.4 in Elbow Lake. The highest CPUE of lake trout was in Second Cranberry Lake, while Third Cranberry had the best CPUE of whitefish.

The mesh sizes in which the highest CPUE of walleye, pike and whitefish were recorded varied for each lake (Appendices 10 to 25). The highest CPUE of walleye were in 7.6, 9.5 and 10.8 cm meshes while the highest CPUE of whitefish were in 7.6, 9.5, 10.8 and 12.7 cm meshes. Pike were caught predominantly in 7.6 cm mesh, except for Second Cranberry Lake where CPUE in 5.1 cm mesh was highest.

Walleye

Age and Growth - Mean age of walleye (sexes combined) ranged from 7.63 years in Third Cranberry Lake to 11.08 years in First Cranberry Lake (Table 6). Maximum ages were from 17 years in Second Cranberry Lake to 27 years in Simonhouse Lake (Appendices 26 to 30). Mean ages of males were similar to females in each lake, the differences were usually less than 1.5 years. In all lakes mean lengths of males were less than females but the mean ages of males were not necessarily younger than for females. Mean condition factors ranged from 1.05 to 1.12, with Third Cranberry walleye being the heaviest at a given length.

In the experimental netting surveys, the heaviest walleye was caught in First Cranberry Lake. It was 4.1 kg and the only Master Angler walleye (minimum weight = 3.6 kg) netted in the study lakes. Maximum weights of walleye in the other lakes were 3.4 kg in Simonhouse and Third Cranberry lakes, 3.2 kg in Second Cranberry Lake, and 2.9 kg in Elbow Lake. Also the majority (51%) of the walleye in the experimental sample from First Cranberry Lake were >1.8 kg. In comparison, walleye >1.8 kg comprised 30% of the sample from Second Cranberry Lake, 13% from Simonhouse, 9% from Third Cranberry Lake and 3% from Elbow Lake.

In all lakes, a strong year class was evident for 1972 (Fig. 11). The 1970 year class also appeared strong in Elbow, Simonhouse and First Cranberry lakes.

Walleye from Elbow Lake, and all male walleye from the other study lakes exhibited positive allometric growth (Table 7). Length - weight regressions for female walleye and both sexes combined generally indicated negative allometric growth.

Table 6. Growth parameters for walleye.

Lake	Sex	n	Mean age (yrs)	Mean length (mm)	Mean weight (g)	Mean condition factor
Simonhouse	Both	144	8.81	465.33	1191.88	1.05
	Male	66	9.03	447.32	1032.12	1.06
	Female	78	8.62	480.56	1327.05	1.05
First Cranberry	Both	51	11.08	537.49	1751.76	1.08
	Male	21	11.81	498.95	1432.38	1.11
	Female	30	10.57	564.47	1975.33	1.06
Second Cranberry	Both	40	8.15	491.10	1404.50	1.09
	Male	22	7.55	448.27	1066.36	1.09
	Female	18	8.89	543.44	1817.78	1.09
Third Cranberry	Both	43	7.63	470.56	1270.35	1.12
	Male	18	7.78	438.89	1096.11	1.12
	Female	25	7.52	493.36	1395.80	1.12
Elbow	Both	260	8.98	402.70	796.10	1.08
	Male	80	8.39	368.85	586.38	1.06
	Female	180	9.10	417.75	889.31	1.09

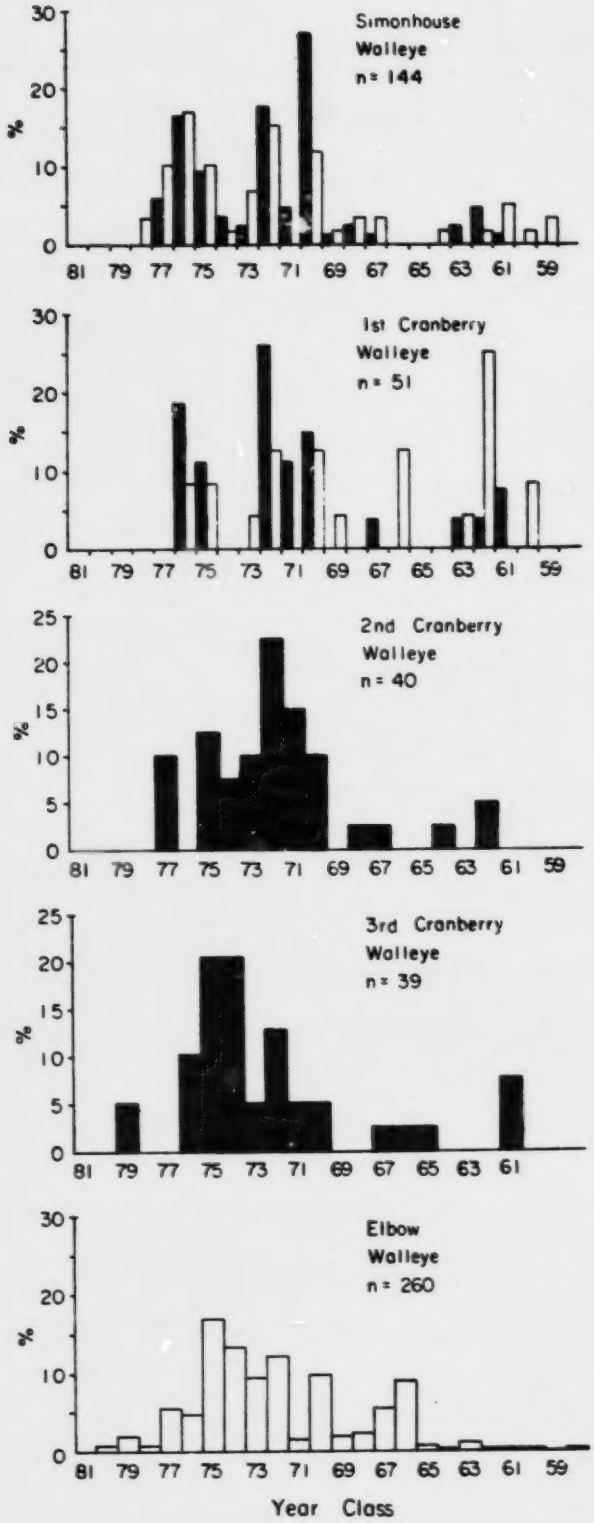


Fig. 11. Year class -% frequencies of walleye. Black bars are 1980 catches and white bars are 1981 catches.

Table 7. Length (mm) - weight (g) regressions for walleye.

Area	Sex	Length-Weight Equation	n	r^2
Simonhouse	Both$_a$	$\log_e$ weight = -11.409 + 2.990 $\log_e$ length	144	0.956
	Both$_b$	$\log_e$ weight = -11.412 + 2.996 $\log_e$ length	19	0.987
	Male$_b$	$\log_e$ weight = -12.083 + 3.103 $\log_e$ length	16	0.983
	Female$_b$	$\log_e$ weight = -11.275 + 2.972 $\log_e$ length	15	0.992
First Cranberry	Both$_a$	$\log_e$ weight = -10.979 + 2.926 $\log_e$ length	51	0.955
	Both$_b$	$\log_e$ weight = -11.244 + 2.971 $\log_e$ length	14	0.984
	Male$_b$	$\log_e$ weight = -11.805 + 3.064 $\log_e$ length	11	0.973
	Female$_b$	$\log_e$ weight = -10.753 + 2.888 $\log_e$ length	11	0.958
Second Cranberry	Both$_a$	$\log_e$ weight = -10.709 + 2.882 $\log_e$ length	40	0.941
	Both$_b$	$\log_e$ weight = -11.770 + 3.056 $\log_e$ length	11	0.989
	Male$_b$	$\log_e$ weight = -11.510 + 3.016 $\log_e$ length	9	0.994
	Female$_b$	$\log_e$ weight = -11.441 + 2.995 $\log_e$ length	8	0.948
Third Cranberry	Both$_a$	$\log_e$ weight = -11.181 + 2.964 $\log_e$ length	43	0.983
	Both$_b$	$\log_e$ weight = -11.366 + 2.997 $\log_e$ length	13	0.993
	Male$_b$	$\log_e$ weight = -11.650 + 3.044 $\log_e$ length	10	0.993
	Female$_b$	$\log_e$ weight = - 9.794 + 2.742 $\log_e$ length	10	0.977
Elbow	Both$_a$	$\log_e$ weight = -11.669 + 3.038 $\log_e$ length	260	0.969
	Both$_b$	$\log_e$ weight = -11.804 + 3.061 $\log_e$ length	22	0.991
	Male$_b$	$\log_e$ weight = -11.652 + 3.035 $\log_e$ length	19	0.986
	Female$_b$	$\log_e$ weight = -12.254 + 3.133 $\log_e$ length	20	0.977

a - calculated using individual lengths and weights from all sampled fish

b - calculated using age-specific mean lengths and weights.

Asymptotic length of Simonhouse Lake walleye (L_∞ = 660mm) was greater than for Elbow Lake walleye (L_∞ = 604mm) (Table 8, Fig.12). Brody growth coefficients indicated a more rapid growth rate for Simonhouse Lake walleye in comparison to walleye from Elbow Lake. Small sizes precluded von Bertalanffy growth equations for walleye from the other lakes.

Survival - Annual survival rates for walleye from Simonhouse and Elbow lakes were high at 0.847 and 0.762 respectively (Table 9). Due to the variability in year class strengths the descending limb of the catch curve was not smooth. Regression estimates approximated the low mortality of these old-aged populations of walleye better than the Robson - Chapman estimates. A similar survival rate estimate of 0.872 (r^2 = 0.265) was obtained for Simonhouse Lake walleye when year class frequencies from 1980 and 1981 were summed instead of age class frequencies. Small sample sizes of walleye from the Cranberry lakes precluded a determination of survival rates.

Maturity - Mean ages at onset of sexual maturity, as estimated by Abrasov's (1967) methods, were higher for Elbow Lake walleye (7.19 years) than for Simonhouse Lake walleye (5.18 years) (Appendices 31 and 35, Table 10). The logistic model to determine ages at maturity (x_o)(Lysack 1980) gave younger ages in comparison to Abrasov's method. Maturity schedules for walleye from the Cranberry lakes are included (Appendices 32 to 34), but small sample sizes prevented calculations of ages at maturity.

Table 8. Linear and/or von Bertalanffy growth equations for fish from Elbow, Simonhouse and Cranberry lakes.

Area	Species	Linear: $\log_e$ length = a + b · $\log_e$ age	r^2	von Bertalanffy: $L_t = L_\infty (1 - e^{-k(t - t_o)})$
Elbow	Walleye	$\log_e$ length = 5.197 + 0.372 $\log_e$ age	0.889	$L_t = 604\ (1 - e^{-0.113(t + 1.901)})$
	Pike	$\log_e$ length = 5.387 + 0.519 $\log_e$ age	0.963	$L_t = 894\ (1 - e^{-0.161(t + 0.480)})$
	Whitefish	$\log_e$ length = 5.151 + 0.285 $\log_e$ age	0.885	$L_t = 466\ (1 - e^{-0.107(t + 2.533)})$
Simonhouse	Walleye	$\log_e$ length = 5.503 + 0.297 $\log_e$ age	0.776	$L_t = 660\ (1 - e^{-0.181(t - 0.498)})$
	Pike	$\log_e$ length = 5.325 + 0.587 $\log_e$ age	0.993	$L_t = 976\ (1 - e^{-0.171(t - 0.486)})$
	Whitefish	$\log_e$ length = 5.240 + 0.291 $\log_e$ age	0.889	
First Cranberry	Pike	$\log_e$ length = 5.700 + 0.430 $\log_e$ age	0.838	
Second Cranberry	Walleye	$\log_e$ length = 5.285 + 0.446 $\log_e$ age	0.928	
	Lake Trout	$\log_e$ length = 4.274 + 0.804 $\log_e$ age	0.928	

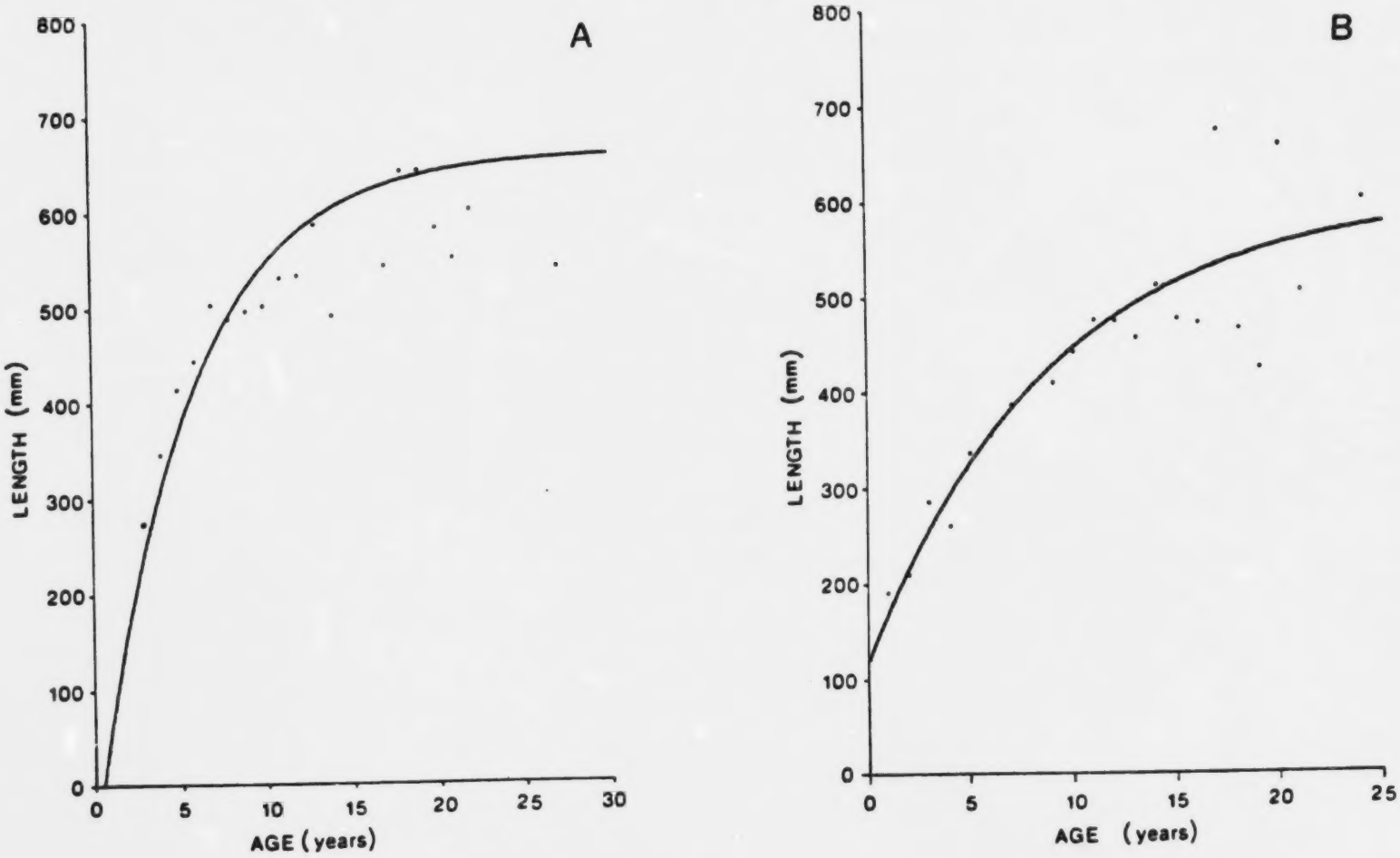


Fig. 12. Von Bertalanffy growth curves for walleye from A) Simonhouse and B) Elbow lakes.

Table 9. Fish mortality and survival rates estimated by Robson-Chapman and regression methods. All regressions significant at P=0.05 and chi-square tests on Robson-Chapman survival estimates were non-significant at P=0.05.

Species	Lake	Ages Used	Robson-Chapman		Regression		
			Instantaneous Mortality (Ẑ)	Annual Survival (Ŝ±2S.E.)	Instantaneous Mortality (Ẑ)	Annual Survival (Ŝ)	r^2
Walleye	Simonhouse	10-14	0.785	0.456±0.120	0.884	0.413	0.880
		10-14,17-21			0.166	0.847	0.508
	Elbow	6-21,24			0.272	0.762	0.743
Pike	Simonhouse	7-13	0.624	0.536±0.052	0.899	0.407	0.980
	First Cranberry	5-9	0.790	0.454±0.097	1.671	0.188	0.925
		5-11			0.807	0.446	0.825
	Third Cranberry	4-8,12,13			0.365	0.694	0.902
	Elbow	6-12	0.611	0.543±0.052	1.306	0.271	0.964
Whitefish	Simonhouse	18-23	0.555	0.574±0.104	0.639	0.528	0.867
	Third Cranberry	18-25			0.274	0.760	0.883
	Elbow	10-12	0.715	0.489±0.150	0.480	0.619	0.877
		9-17,19-25			0.136	0.873	0.633

Table 10. Maturity rate equations and mean weighted age at onset of sexual maturity for fish from Elbow and Simonhouse lakes.

Species	Lake	Sex	$\log_e (k - y) = bx_o - b_x$ Regression	r^2_Y	Age of Maturity - x_o (yrs)	Abrasov's Mean age of maturity (yrs)
Walleye	Elbow	Male	Y = 5.493 - 0.855x	0.908	6.42	7.30
		Female	Y = 5.912 - 0.915x	0.851	6.46	7.18
		Both	Y = 6.088 - 0.933x	0.938	6.52	7.19
	Simonhouse	Male	-	-	-	5.17
		Female	Y = 6.700 - 1.386x	0.923	4.83	5.33
		Both	Y = 9.023 - 1.913x	0.903	4.72	5.18
Pike	Elbow	Male	Y = -1.234 - 0.239x	0.589	5.16	3.43
		Female	Y = 2.525 - 0.734x	0.789	3.44	4.26
		Both	Y = 3.891 - 1.000x	0.860	3.89	4.12
	Simonhouse	Male	Y = 2.574 - 0.805x	0.905	3.20	4.23
		Female	Y = 2.160 - 0.672x	0.841	3.21	4.44
		Both	Y = 2.828 - 0.845x	0.974	3.35	4.13

Diet - Based on the limited analysis of walleye stomachs it appears that cisco and perch were the main diet items in the Cranberry lakes. Brook stickleback, cisco, shiners (spottail and other unidentified species) and white sucker occurred most frequently in the stomachs of Simonhouse Lake walleye. Ephemeroptera (mayfly nymphs) predominated in the stomachs of Elbow Lake walleye, followed in frequency of occurrence by fish (brook stickleback and unidentified fish remains) and crayfish.

Pike

Age and Growth - Mean ages of pike (sexes combined) ranged from 4.75 years in Third Cranberry Lake to 6.42 years in Simonhouse Lake (Table 11, Fig. 13). Mean lengths, weights and condition factors were similar between the lakes, with Third Cranberry Lake pike being the shortest and lightest. Mean ages and mean lengths of males and females were similar within each lake. Maximum ages of pike were 13+ years in Simonhouse, Third and Elbow lakes, 11+ years in First Cranberry Lake and 9+ years in Second Cranberry Lake (Appendices 36 to 40).

All the pike netted were less than the minimum weight (9 kg) required for a Master Angler award. The heaviest pike caught weighed 8.3 kg and was taken from Simonhouse Lake. Pike weighing <5 kg comprised 97 to 100% of the samples taken from each lake.

Length - weight regressions for pike were quite variable with males and females having either positive or negative allometric growth (Table 12).

Table 11. Growth parameters for pike.

Lake	Sex	n	Mean age (yrs)	Mean length (mm)	Mean weight (g)	Mean condition factor
Simonhouse	Both	369	6.42	595.50	1823.77	0.75
	Male	145	6.02	561.67	1480.21	0.74
	Female	224	6.68	617.40	2046.16	0.76
First Cranberry	Both	85	5.51	606.68	1841.65	0.78
	Male	52	5.52	592.81	1735.00	0.80
	Female	33	5.48	628.55	2009.70	0.74
Second Cranberry	Both	16	5.69	567.63	1414.38	0.70
	Male	9	5.67	571.78	1433.33	0.72
	Female	7	5.71	562.29	1390.00	0.67
Third Cranberry	Both	63	4.75	543.59	1378.32	0.74
	Male	33	4.85	530.73	1319.82	0.75
	Female	30	4.63	557.73	1442.67	0.73
Elbow	Both	287	5.94	558.52	1455.04	0.73
	Male	139	5.68	532.21	1297.63	0.74
	Female	145	6.22	585.98	1617.35	0.71

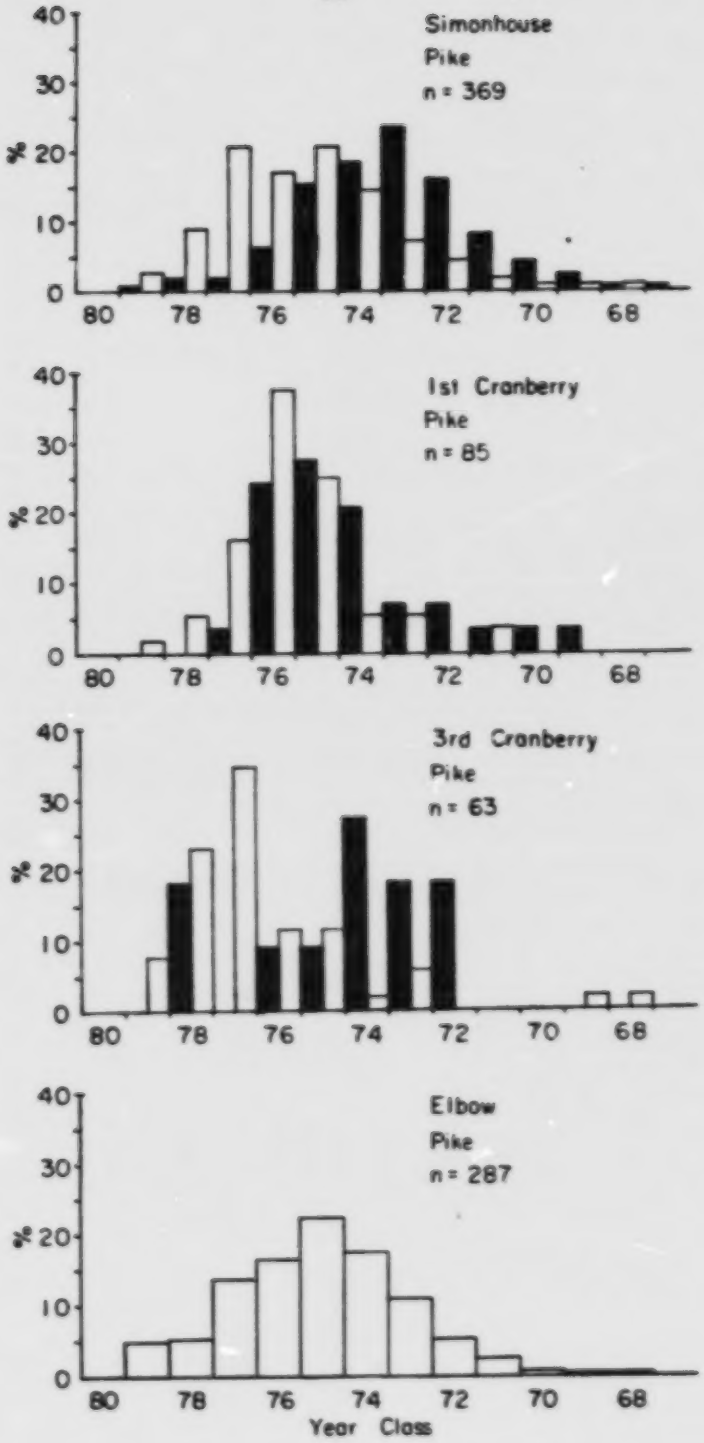


Fig. 13. Year class -% frequencies for pike. Black bars are 1980 catches and white bars are 1981 catches.

Table 12. Length (mm) - weight (g) regressions for pike.

Area	Sex	Length-Weight Equation	n	r^2
Simonhouse	$Both_a$	$\log_e$ weight = -11.657 + 2.975 $\log_e$ length	369	0.947
	$Both_b$	$\log_e$ weight = -12.188 + 3.071 $\log_e$ length	13	0.994
	$Male_b$	$\log_e$ weight = -11.955 + 3.034 $\log_e$ length	12	0.995
	$Female_b$	$\log_e$ weight = -12.656 + 3.142 $\log_e$ length	13	0.990
First Cranberry	$Both_a$	$\log_e$ weight = -10.079 + 2.735 $\log_e$ length	85	0.903
	$Both_b$	$\log_e$ weight = -12.049 + 3.051 $\log_e$ length	10	0.994
	$Male_b$	$\log_e$ weight = -10.292 + 2.777 $\log_e$ length	8	0.998
	$Female_b$	$\log_e$ weight = -14.492 + 3.419 $\log_e$ length	8	0.987
Second Cranberry	$Both_a$	$\log_e$ weight = -12.657 + 3.123 $\log_e$ length	16	0.979
	$Both_b$	$\log_e$ weight = -12.773 + 3.142 $\log_e$ length	7	0.983
Third Cranberry	$Both_a$	$\log_e$ weight = -10.918 + 2.855 $\log_e$ length	63	0.962
	$Both_b$	$\log_e$ weight = -11.082 + 2.885 $\log_e$ length	9	0.990
	$Male_b$	$\log_e$ weight = -11.218 + 2.906 $\log_e$ length	8	0.988
	$Female_b$	$\log_e$ weight = -10.767 + 2.834 $\log_e$ length	8	0.991
Elbow	$Both_a$	$\log_e$ weight = -11.851 + 3.002 $\log_e$ length	287	0.974
	$Both_b$	$\log_e$ weight = -11.865 + 3.014 $\log_e$ length	12	0.996
	$Male_b$	$\log_e$ weight = -11.737 + 2.994 $\log_e$ length	12	
	$Female_b$	$\log_e$ weight = -11.486 + 2.951 $\log_e$ length	10	

a - calculated using individual lengths and weights from all sampled fish.

b - calculated using age-specific mean lengths and weights

Asymptotic length of Simonhouse Lake pike (L_∞ = 976mm) was greater than for Elbow Lake pike (L_∞ = 894mm) (Table 8, Fig. 14). Both linear and von Bertalanffy growth equations indicated a slightly faster growth rate for Simonhouse Lake pike. Except for First Cranberry Lake, growth equations for pike in the other study lakes could not be calculated because of small sample sizes.

Survival - Robson- Chapman estimates of pike survival were similar for Simonhouse, First Cranberry and Elbow lakes, ranging from 0.454 to 0.543 (Table 9). Survival rate estimates calculated by the regression method and including the same ages used in the Robson-Chapman estimates were much lower ranging from 0.188 to 0.407. By including ages 5+ to 11+ in the regression estimate for First Cranberry Lake pike, the survival was similar to the Robson-Chapman value. Third Cranberry Lake pike had the best survival at 0.694, based on the regression method. Similar survival rate estimates were obtained when year class frequencies of the 1980 and 1981 data were summed instead of age class frequencies.

Maturity - Ages of maturity of pike (sexes combined) from Elbow and Simonhouse lakes were 4.12 and 4.13 respectively using Abrasov's method, and 3.89 and 3.35 respectively using the logistic model (Table 10, Appendices 41 and 45). Male pike from Elbow Lake did not show a typical maturation trend resulting in a low correlation coefficient (r^2) of 0.589. This caused a wide discrepancy in the ages of maturity for male pike from Elbow Lake obtained using the two methods. In all other cases the logistic model provided ages of maturity which were up to 1.2 years less than by Abrasov's method.

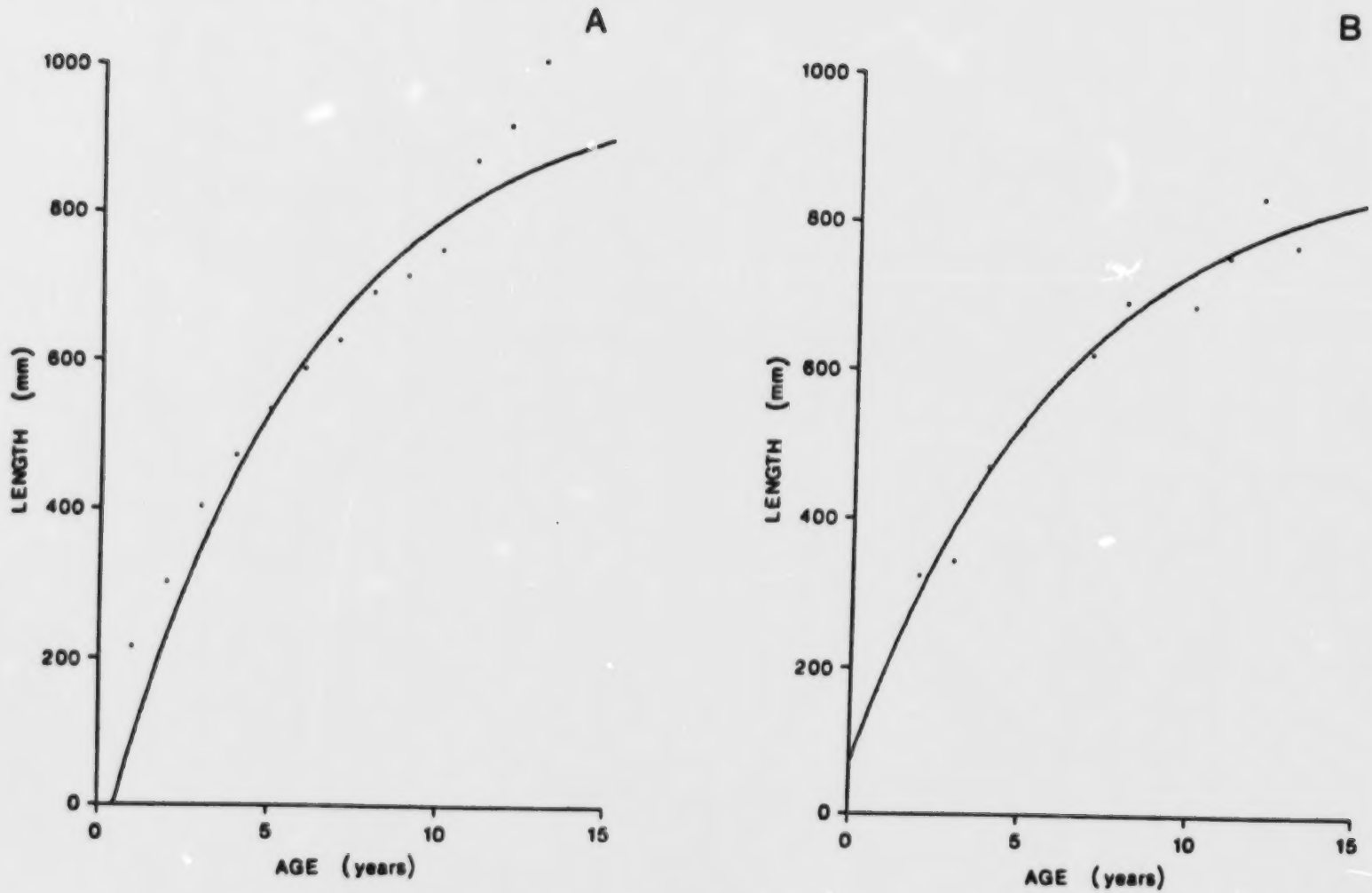


Fig. 14. Von Bertalanffy growth curves for pike from A) Simonhouse and B) Elbow lakes.

Maturity schedules for pike from the Cranberry lakes are included (Appendices 42 to 44), but small sample sizes precluded calculations of ages of maturity.

Diet - White sucker and cisco predominated in the pike stomachs from all the study lakes, and occurred almost exclusively in the pike from the Cranberry lakes. Spottail shiners, brook sticklebacks and crayfish occurred frequently in pike stomachs from Simonhouse Lake, while burbot, walleye and pike occurred infrequently. Ephemeroptera (mayfly nymphs) and crayfish contributed significantly to the diet of Elbow Lake pike.

Whitefish

Age and Growth - Mean ages of whitefish in the experimental samples were between 13.09 and 15.26 years (sexes combined) (Table 13). In each lake, mean ages of males were greater than for females, although the mean lengths, weights and condition factors were similar between sexes.

Age structures for whitefish from Simonhouse, Second Cranberry, Third Cranberry and Elbow lakes were multi - modal with maximum ages in the catches ranging from 25+ to 28+ years (Fig. 15, Appendices 46 to 50).

Length - weight regressions for whitefish indicated negative allometric growth for Simonhouse, First Cranberry and Third Cranberry lakes, positive allometric growth for Second Cranberry Lake, and isometric growth for Elbow Lake (Table 14). Based on linear growth equations, Simonhouse Lake whitefish were growing slightly faster than Elbow Lake whitefish (Table 8). Except for Elbow Lake whitefish

Table 13. Growth parameters for whitefish.

Lake	Sex	n	Mean age (yrs)	Mean length (mm)	Mean weight (g)	Mean condition factor
Simonhouse	Both	159	14.89	417.29	1042.14	1.41
	Male	62	15.18	417.52	1038.39	1.41
	Female	97	14.75	417.14	1044.54	1.41
First Cranberry	Both	16	14.69	399.25	890.00	1.35
	Male	10	14.90	400.80	898.00	1.34
	Female	6	14.33	396.67	876.67	1.37
Second Cranberry	Both	107	13.09	378.82	752.34	1.26
	Male	45	13.76	381.60	796.22	1.30
	Female	62	12.61	376.81	720.48	1.23
Third Cranberry	Both	138	15.26	374.63	703.88	1.32
	Male	63	15.49	374.32	700.32	1.33
	Female	75	15.07	374.89	706.88	1.31
Elbow	Both	122	13.39	363.07	714.84	1.44
	Male	56	13.52	367.41	746.61	1.45
	Female	65	13.38	360.00	691.08	1.43

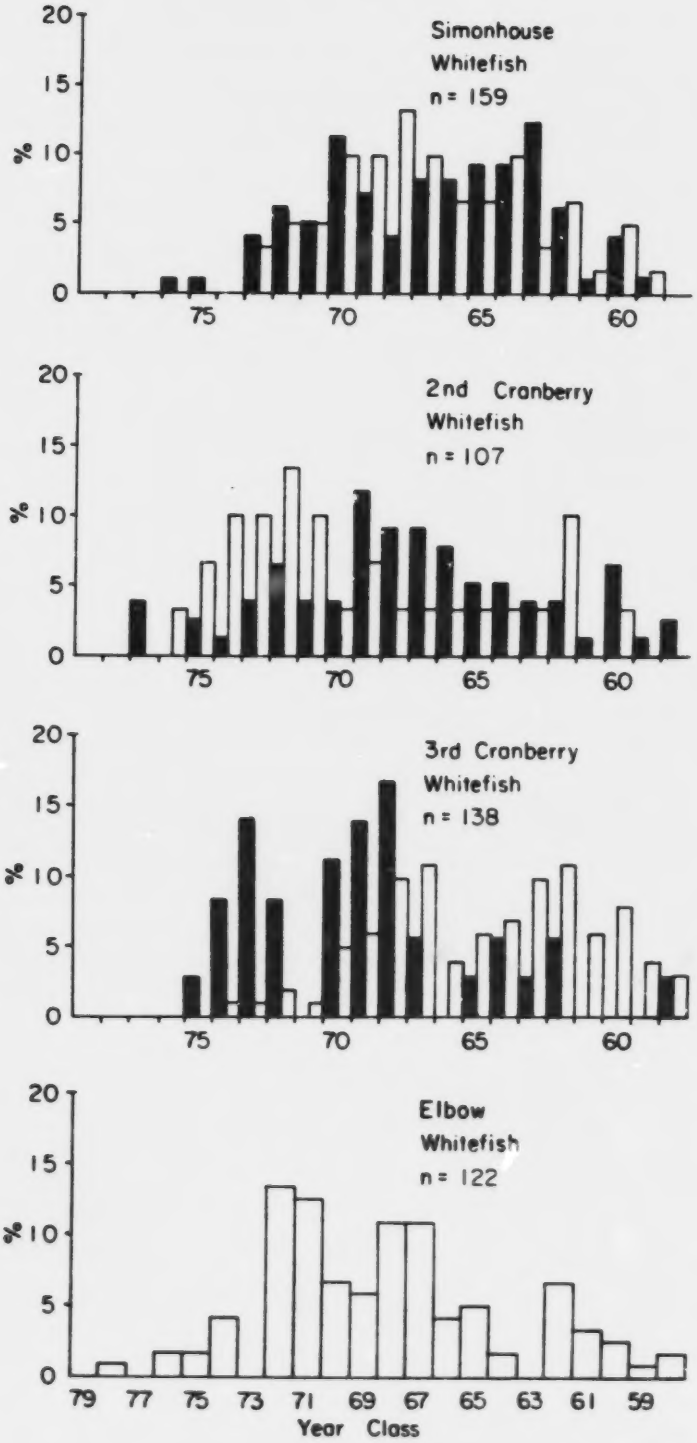


Fig. 15. Year class -% frequencies of whitefish. Black bars are 1980 catches and white bars are 1981 catches.

Table 14. Length (mm) - weight (g) regressions for whitefish.

Area	Sex	Length-Weight Equation	n	r^2
Simonhouse	Both$_a$	$\log_e$ weight = - 9.658 + 2.748 $\log_e$ length	159	0.848
	Both$_b$	$\log_e$ weight = - 9.726 + 2.757 $\log_e$ length	20	0.922
	Male$_b$	$\log_e$ weight = - 8.249 + 2.516 $\log_e$ length	16	0.879
	Female$_b$	$\log_e$ weight = -10.019 + 2.808 $\log_e$ length	19	0.909
First Cranberry	Both$_a$	$\log_e$ weight = -10.060 + 2.806 $\log_e$ length	16	0.925
	Both$_b$	$\log_e$ weight = -10.356 + 2.854 $\log_e$ length	11	0.947
Second Cranberry	Both$_a$	$\log_e$ weight = -12.317 + 3.174 $\log_e$ length	107	0.969
	Both$_b$	$\log_e$ weight = -10.955 + 2.948 $\log_e$ length	23	0.979
	Male$_b$	$\log_e$ weight = -12.327 + 3.184 $\log_e$ length	20	0.989
	Female$_b$	$\log_e$ weight = -11.318 + 3.004 $\log_e$ length	22	0.964
Third Cranberry	Both$_a$	$\log_e$ weight = - 9.052 + 2.631 $\log_e$ length	138	0.855
	Both$_b$	$\log_e$ weight = - 9.405 + 2.691 $\log_e$ length	21	0.968
	Male$_b$	$\log_e$ weight = - 7.150 + 2.311 $\log_e$ length	17	0.800
	Female$_b$	$\log_e$ weight = -10.162 + 2.818 $\log_e$ length	20	0.981
Elbow	Both$_a$	$\log_e$ weight = -11.160 + 3.002 $\log_e$ length	122	0.929
	Both$_b$	$\log_e$ weight = -11.142 + 2.999 $\log_e$ length	20	0.992
	Male$_b$	$\log_e$ weight = -11.178 + 3.009 $\log_e$ length	18	0.967
	Female$_b$	$\log_e$ weight = -11.242 + 3.011 $\log_e$ length	19	0.984

a - calculated using individual lengths and weights from all sampled fish

b - calculated using age-specific mean lengths and weights

(Fig. 16), the small number of whitefish caught in the study lakes and the paucity of small whitefish in the catches precluded a determination of realistic growth equations.

Survival - High survival (0.528 to 0.873) was found for the old-aged whitefish populations in Simonhouse, Third Cranberry and Elbow lakes (Table 9). Although Robson-Chapman estimates were similar to regression estimates of survival it is expected that the latter method would give better approximations because of the variability in whitefish year class strengths (Fig. 15). Similar survival estimates were obtained when year class frequencies were summed instead of age class frequencies.

Maturity - Maturity schedules for whitefish indicated males and females matured as early as age 6+ and most fish were mature by age 9+ or 10+ (Appendices 51 to 55). More precise determination of ages of maturity could not be calculated because of the small numbers of fish at each age.

Diet - Whitefish concentrated on Gastropoda in Simonhouse Lake but fed on Pelecypoda, Ephemeroptera and Gastropoda in Elbow Lake.

Lake Trout

A small number of lake trout were caught in Elbow and the Cranberry lakes in 1980 and 1981 (Appendix 56). Most of the lake trout were netted in Second Cranberry Lake. The largest (9.5 kg) and oldest (25+ yrs) trout was captured in Third Cranberry Lake. Although growth was described by a linear equation for Second Cranberry Lake trout (Table 8), sample size was very small (n=20) and may not truly

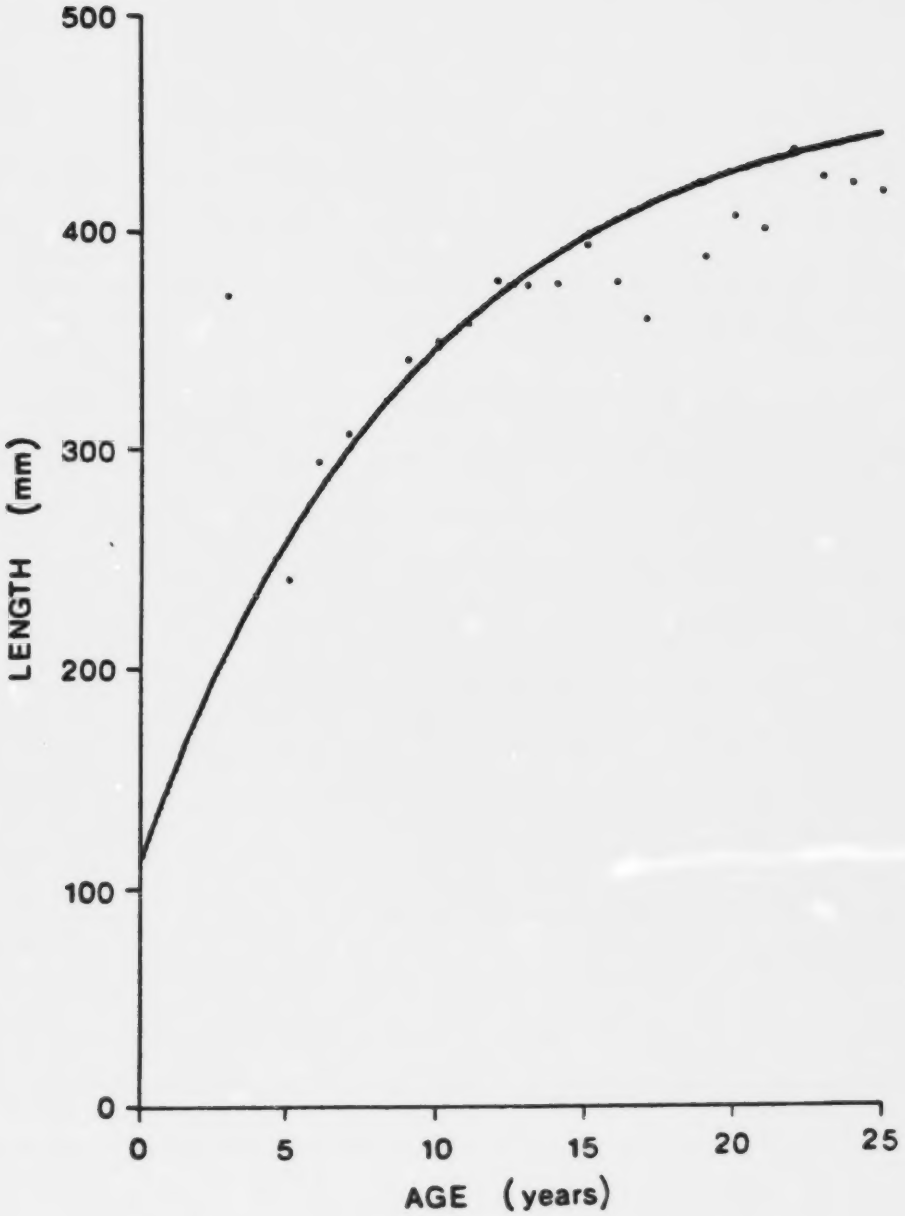


Fig. 16. Von Bertalanffy growth curve for whitefish from Elbow Lake.

represent growth of the trout population. Maturity data were limited but indicated that males were not mature until age 10+ (Appendix 57).

Forage Fish

Rotenone treatments on the study lakes (Figs. 2, 4, 6, 8 and 10) yielded at least seven species of fish from each lake (Table 15). Most predominant species in the samples were common shiner in Simonhouse Lake, johnny darter in First Cranberry Lake, brook stickleback in Second Cranberry Lake, white sucker in Third Cranberry Lake and yellow perch in Elbow Lake.

DISCUSSION

Assessment of Present Stocks

Comparison of species composition and CPUE from the 1975/76 (Scaife 1977(b)) and 1980/81 experimental netting surveys indicated a general increase in the abundance of pike, cisco, whitefish and lake trout, and a decrease or stabilization in the abundance of walleye and white suckers (Table 16, Appendix 58). From 1975/76 to 1980/81 the relative and absolute abundance of walleye increased or decreased only slightly in the three Cranberry lakes, but decreased by half in Simonhouse Lake. The percent composition and CPUE of walleye in Simonhouse Lake is similar now to the abundances recorded for the Cranberry lakes. Pike increased in abundance in the Cranberries and Simonhouse lakes from 1975/76 to 1980/81. In the 1975/76 netting surveys walleye were more abundant than pike, whereas in the 1980/81 surveys pike were more abundant than walleye in all lakes except Second Cranberry.

Table 15. Species composition (%) of fish collected using rotenone.

Species	Simonhouse	First Cranberry	Second Cranberry	Third Cranberry	Elbow
Pike *(Esox lucius)*	0.44				0.28
Burbot *(Lota lota)*	3.30		12.26		0.35
White sucker *(Catostomus commersoni)*	-	2.00	11.32	29.79	0.35
Yellow perch *(Perca flavescens)*	5.49	10.00	0.47	12.77	73.79
Johnny darter *(Etheostoma nigrum)*	11.43	54.00	3.30	29.08	10.89
Iowa darter *(Etheostoma exile)*	-	2.00		0.71	
Longnose dace *(Rhinichthys cataractae)*	5.49		24.53		
Blacknose dace *(Rhinichthys atratulus)*	1.76				
Emerald shiner *(Notropis atherinoides)*	3.96				
Common shiner *(Notropis cornutus)*	35.38	25.00		11.35	
Spottail shiner *(Notropis hudsonius)*	20.44	6.00	1.41	4.96	4.01
Brook stickleback *(Culaea inconstans)*	0.88		33.02	9.93	3.23
Nine-spine stickleback *(Pungitius pungitius)*	0.66				1.76
Trout-perch *(Percopsis omiscomaycus)*	-	1.00	7.55		0.07
Slimy sculpin *(Cottus cognatus)*	10.99		6.13	1.42	5.27
Total number caught	455	100	212	141	1423

Table 16. Mean percent composition and catch per unit of effort (number.9la^{-1}night^{-1}, in parentheses) for fish caught in Simonhouse and the Cranberry lakes in 1975 and/or 1976 and 1980/1981.

Species	First Cranberry		Second Cranberry		Third Cranberry		Simonhouse	
	1975/76	1980/81	1975/76	1980/81	1975/76	1980/81	1976	1980/81
Whitefish	0.3(0.07)	2.5(0.9)	21.2(5.9)	24.4(4.9)	13.5(5.8)	16.8(7.8)	0.8(6.2)	10.9(3.5)
Cisco	16.3(4.3)	37.8(13.3)	20.9(5.9)	30.8(6.2)	32.3(13.9)	53.6(24.9)	24.4(7.3)	12.6(4.0)
Lake Trout		0.2(0.05)	2.0(0.6)	4.7(0.9)	-	0.4(0.1)	-	
Pike	6.5(1.7)	13.7(4.8)	1.5(0.4)	4.2(0.9)	3.2(1.4)	7.8(3.6)	11.6(3.5)	25.9(8.2)
Walleye	9.5(2.5)	8.4(2.9)	7.9(2.2)	9.3(1.9)	7.4(3.2)	5.2(2.5)	20.6(6.2)	10.0(3.1)
Yellow perch	16.9(4.4)	23.0(8.1)			3.6(1.5)	5.0(2.3)	3.6(1.1)	3.5(1.1)
Burbot		0.8(0.3)	10.2(2.9)	1.5(0.3)		1.2(0.5)		0.3(0.1)
White sucker	50.5(4.8)	13.6(4.8)	36.2(10.1)	25.1(5.0)	40.1(17.3)	10.0(4.7)	38.9(11.6)	36.8(11.7)
Total catch	(26.3)	(35.2)	(28.0)	(20.0)	(43.1)	(46.6)	(29.9)	(31.7)

White suckers were the most abundant species in all the lakes in 1975/76 but they have decreased in abundance in the Cranberry lakes and remained stable in Simonhouse Lake. In contrast, cisco abundance has increased in the Cranberry lakes and decreased in Simonhouse Lake. Also whitefish abundance has generally increased in all the lakes.

Relative abundance of lake trout in Second Cranberry Lake has increased, and although CPUE has increased slightly it remains below 1 fish $\cdot$ 9lm^{-1} $\cdot$ night^{-1} in 1980/81.

According to T. Smith, a lodge owner on First Cranberry Lake, anglers seek primarily walleye and to a lesser extent pike between May 1 and June 15. T. Smith and P. Rod (Man. Dept. Nat. Res., Conservation Officer) reported that angler success for walleye has declined since 1970 on the Cranberry lakes. Comparisons of angler CPUE for creel census surveys in 1968 (Conservation Officer patrols) and 1976 (Scaife 1977(a)) substantiates their observations (Table 17). In May and June of 1968 angler success for walleye was high and consequently only a small number of pike were caught (or sought) by anglers. In 1976 although anglers probably preferred to catch walleye, very few were taken, and therefore most of the angler creels were pike. Data from 1958 (Man. Fisheries Branch memo), unfortunately does not include May, when most walleye would be caught. CPUE of walleye and pike in June of 1958, in comparison to data from 1968 and 1976, are difficult to explain unless the anglers were seeking primarily pike instead of walleye at this time. CPUE of lake trout in June, July and August were similar in the three years. Reported angling effort in

Table 17. Comparison of average catch per hour for creel census surveys on the Cranberry lakes in 1958 (Man. Fisheries memo), 1968 (Conservation Officer patrols) and 1976 (Scaife 1977(a)).

Month	Walleye			Pike			Lake Trout		
	1958	1968	1976	1958	1968	1976	1958	1968	1976
May	-	0.42	0.09	-	0.22	0.40	-	0	0.02
June	0.09	0.29	0.13	0.56	0.09	0.35	0.01	0.02	0.01
July	0.13	0.19	-	0.38	0.47	-	-	0.03	-
August	0.24	0.03	-	0.73	0.18	-	0.02	0.03	-
September	1.70	-	-	1.93	-	-	1.59	-	-

September of 1958 was very limited and CPUE should be interpreted with caution. Similarly, in July 1976, the total angling effort censused was inadequate for reliable CPUE estimates, and therefore the data were excluded from this analysis.

Using an evaluation scheme of angling success based on catch per hour (Andrews 1968, Appendix 59), angling success of 0.11 walleye $\cdot$ hour^{-1} (1976 data) in the Cranberry lakes would be categorized as fair. In comparison to other northern lakes which are angled moderately to intensively, CPUE of walleye in the Cranberry lakes was higher than in Kississing (Maher and Hagenson 1975) and Athapapuskow (Schlick 1973; Sigurdson and Scaife 1976) lakes but lower than the good to excellent angling success found in God's (Hagenson and O'Connor 1978), Reed (Bruederlin and Wright 1981) and Goose (Bruederlin 1982) lakes (Table 18). In comparison to southern sport fisheries CPUE of walleye in the Cranberry lakes was similar to that found for walleye in nine Whiteshell lakes in 1965 (0.13 fish $\cdot$ hour^{-1}) and 1968 (0.11) (Miller et al. 1970).

Angling success for pike in the Cranberry lakes would be considered good at 0.38 pike $\cdot$ hour^{-1}. However, angling success was much higher in Kississing, God's, Reed and Goose lakes, and these lakes would be categorized as excellent. CPUE of pike in the Cranberries (0.40) was higher than in the Whiteshell lakes, which averaged 0.28 in 1965 and 0.18 in 1968 (Miller et al. 1970).

At 0.02 lake trout $\cdot$ hour^{-1}, angling success in the Cranberry lakes would be considered fair. In comparison lake trout angling would be good to excellent in Athapapuskow, God's and Reed lakes.

Table 18. Comparison of average catch per hour for creel census surveys on northern lakes.

Lake (Survey period)	Total Hours Fished	CPUE All Fish	CPUE Walleye	CPUE Pike	CPUE Trout
Cranberries					
(June - Aug., 1958)	792.0	0.88	0.19*	0.65*	0.02
(May - Aug., 1968)	597.0	0.59	0.25*	0.32*	0.03
(May - June, 1976)	3,012.5	0.56	0.11*	0.38*	0.02
Athapapuskow					
(June - Sept., 1968)	2,130.0	0.24	0.06	0.03	0.13*
(May - Sept., 1975)	27,335.0	0.50	0.10	0.18	0.18*
Kississing					
(June, 1974	791.5	2.36	0.02	2.33*	0.006
Gods					
(June - Aug., 1974)	6,827.0	2.43	0.70*	1.65*	0.08
(June - July, 1975)	8,500.0	1.44	0.47*	0.86*	0.06
Reed					
(May - Sept., 1979)	3,206.5	2.44	0.59*	1.70*	0.06
Goose					
(May - Sept., 1979)	516.5	6.70	2.52*	4.11	

* denotes principle species sought by anglers.

Unfortunately in creel census surveys it is very difficult to partition effort (i.e. no. of hours fished) for each species. Therefore in lakes where anglers are seeking, for example, primarily lake trout but capture walleye or pike incidentally, it results in an underestimate in the CPUE of walleye and pike. For example, in Lake Athapapuskow Schlick (1973) noted that CPUE of walleye was 0.25 in one area (Baker's Narrows) where only walleye were sought. The mean CPUE of walleye in Lake Athapapuskow was 0.10. Consequently in the comparison of CPUE statistics (Table 18) principal species sought by most anglers have been identified by an asterisk so that a better judgement can be made of the CPUE statistics. Since all of these creel census surveys were done without partitioning effort for each species, the CPUE data should be comparable for lakes where the same principal species were sought.

Despite the limitations of a comparison of creel census surveys from different lakes, it is evident that angling for walleye and pike in the Cranberry lakes offers fair to good success, similar to the Whiteshell lakes, but lower than in God's, Reed and Goose lakes. Also, Master Angler Awards indicate that the number of trophy walleye and pike has generally declined, while the number of trophy lake trout from Second Cranberry Lake have been relatively consistent from 1960 to 1982 (Appendix 60).

High CPUE statistics for game fish in experimental gill nets does not necessarily infer high angler success. CPUE of walleye in experimental nets in Simonhouse and the Cranberry lakes was

between 1.9 and 6.2 fish · $91m^{-1}$ · $16h^{-1}$ in 1975/76 and 1980/81, which supported creel census data of fair angling success at 0.11 walleye · angler hour $^{-1}$ (1976 data). Similarly Tramping Lake reported fair angling success for walleye, and the CPUE in experimental nets was low at 3.8 fish · $91m^{-1}$ · $21h^{-1}$ (Leroux 1982). However CPUE of walleye in experimental nets in Big Whiteshell Lake was relatively high at 15.5 fish · $91m^{-1}$ · $night^{-1}$ while angler success was determined to be fair at 0.18 walleye · $hour^{-1}$ (D. Fitzjohn, Man. Dept. Nat. Res. pers. comm.). Angler success is considered a less quantitative measure of fish abundance than experimental netting because angler success is greatly affected by forage fish abundance, lake morphometry, time of day and season, and angler skill.

Recommended angling harvests of the combined catches of walleye and pike from Simonhouse, Elbow and the Cranberry lakes are between 51,000 and 65,000 kg · yr^{-1}. Hagenson and O'Connor (1978) derived an equation for estimating the optimum angling yield (OSY) for moderate quality fisheries by plotting indices (MEI) against angling harvests from nine Whiteshell lakes. The OSY for Simonhouse, Elbow and the Cranberry lakes was approximately 65,000 kg · yr^{-1} (Table 19). SPOF (1982) has recommended that 82% of the maximum sustainable yield (MSY) could be allocated to a sport fishery of walleye (32% of MSY), pike (25% of MSY) and lake trout (25% of MSY). Realistically Simonhouse, Elbow and the Cranberry lakes are primarily walleye and pike sport fisheries. Therefore combined annual harvests of walleye and pike should be less than 57% of the MSY, which equals a total of 51,000 kg for the five lakes.

Scaife (1977(a)) estimated that 8500 kg of walleye, pike and lake trout were harvested by Viking and Caribou lodge guests between

Table 19. Estimated maximum sustainable yields (MSY) and optimum sustainable angling yields (OSY) for Simonhouse, Elbow and the Cranberry lakes.

Lake	Area (ha)	MEI	MSY		OSY	
			$kg \cdot ha^{-1} \cdot yr^{-1}$ ($Y=1.4(MEI^{0.45})$)	$kg \cdot yr^{-1}$	$kg \cdot ha^{-1} \cdot yr^{-1}$ ($Y=0.492(MEI^{0.673})$)	$kg \cdot yr^{-1}$
Simonhouse	8198	35.40	6.97	57133	5.43	44479
First Cranberry	1341	23.22	5.76	7730	4.08	5478
Second Cranberry	1708	5.52	3.02	5158	1.55	2653
Third Cranberry	1008	23.21	5.76	5810	4.08	4116
Elbow	3218	11.83	4.26	13695	2.59	8350

May 1 and June 30, 1976. Most of the walleye and pike would be harvested from First Cranberry and Simonhouse Lake Narrows during this period (T. Smith, Viking lodge owner pers. comm.). It is believed that sport fish harvests in the last 5 to 10 years have been well below the recommended limits for Simonhouse and the Cranberry lakes. However it is suspected that prior to 1970 angler harvests were much greater than the recommended harvests, since angler success and effort had been much higher before 1970 (T. Smith and P. Rod pers comm.). Intensive exploitation would have reduced the size of the sport fish populations and the quality of the sport fishery to the present level of moderate quality angling. Continued harvesting of walleye in Simonhouse and the Cranberry lakes at the present level will only, at best, maintain the sport fisheries at their present status.

Walleye and pike stocks in Elbow Lake may be significantly reduced if angler exploitation continues to increase as a result of decreasing angler CPUE in Simonhouse and the Cranberry lakes. Annual angler harvests of pike and walleye in Elbow Lake should be less than 8,000 kg (OSY or 57% of MSY; Table 19) to protect existing stocks and maintain the good angler success rate.

Walleye Year Class Strength

Similar weak and strong year classes of walleye were evident from the study lakes. The 1972 year class of walleye was strong in all the lakes, while 1970 was relatively strong in Simonhouse, First Cranberry and Elbow lakes (Fig. 11). In the combined walleye catches from all the study lakes, 1972, 1970, 1966 and 1962 appear strong, while in the combined walleye catches from the Cranberries and Simonhouse lakes 1972, 1970 and 1962 appear strong (Fig. 17).

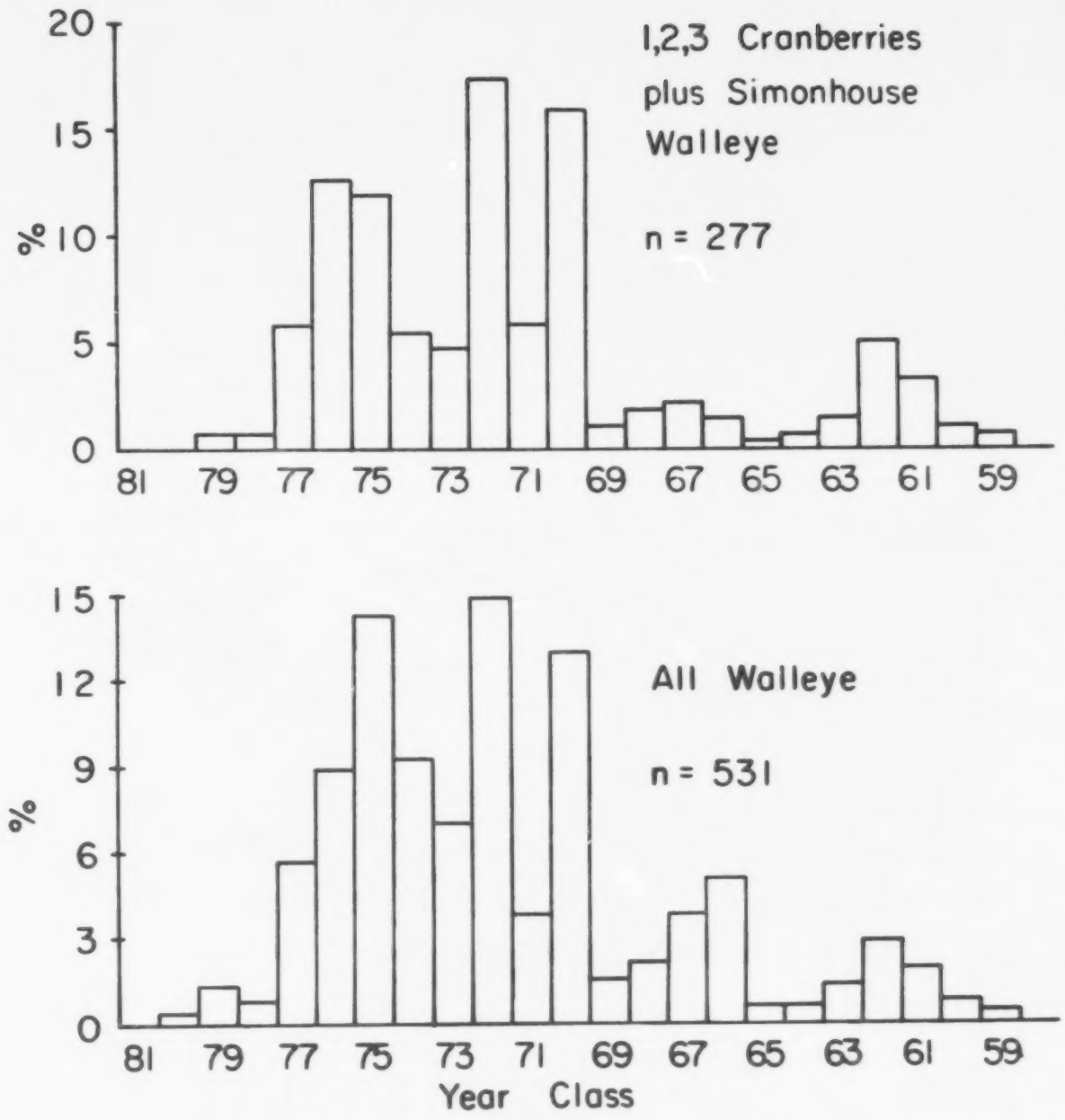


Fig. 17. Combined year class -% frequencies of walleye.

Total monthly precipitation as either snowfall or rainfall from October to June, inclusive was plotted against the temperature indices for each year (Fig. 18(a)). The stronger year classes, 1962, 1970 and 1972, could be separated by a horizontal line from all other year classes except 1975. Although 1975 appears to be a strong year class from the age-frequencies, this may be artificial because 1975 may be the youngest, and therefore most numerous year class which is fully vulnerable to the fishing gear. The 1975 year class as well as year classes younger than 1975 were therefore excluded from being assessed either weak or strong. From this graph it appeared that year class strengths were not dependent on temperature since the strong 1970 year class had the minimum number of consecutive days at $\geq 12^{\circ}C$ and all the strong year classes had $\geq$330mm of precipitation.

When spring precipitation (April to June, inclusive) was plotted against the temperature indices it was apparent, based on the 1962 year class, that year class strengths may be dependent on temperatures when precipitation is average (Fig. 18(b)). Comparing the two graphs it is evident that spring precipitation (April to June) comprises >38% of the October to June precipitation in the years when strong year classes were produced. Also, in the springs of 1962, 1970 and 1972 above average precipitation occurred in April and/or June, and May was below average.

A relatively strong 1966 year class was apparent in Elbow and First Cranberry lakes. The general nature of the temperatures - precipitation relationship precluded a determination of specific climatic conditions for each lake. It was not possible therefore

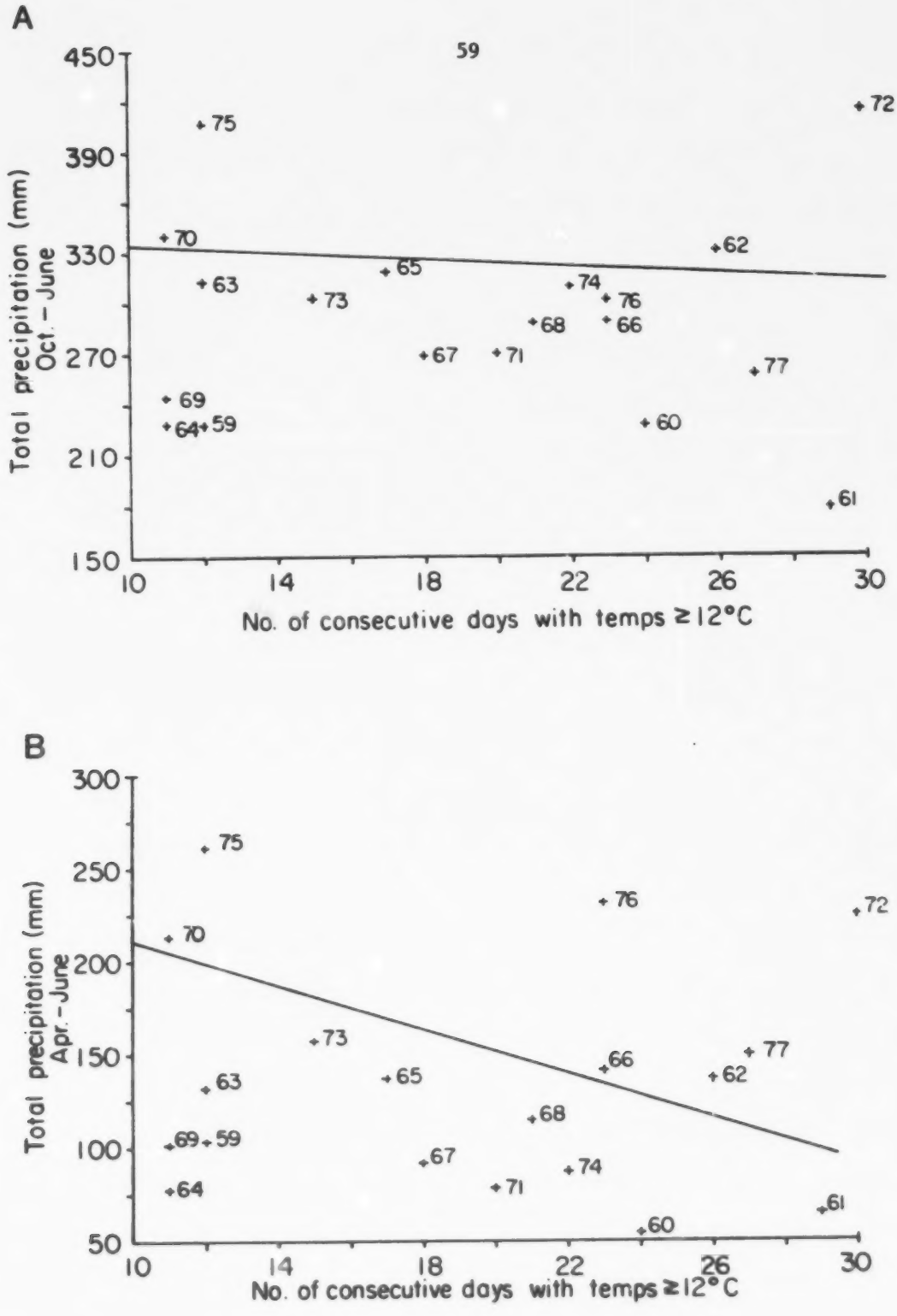


Fig. 18. Relationship between the number of consecutive days with temperatures $\geq 12^{0}$C and total precipitation from A) October to June, and B) April to June for the years 1959 to 1977.

to ascertain why 1966 was stronger in these lakes than in the others. Its position on Fig. 18(b) was proximal to the strong 1962 year class and conceivably slight alterations in climate could have effected a strong or weak 1966 year class.

Walleye reproductive success has been correlated with river discharges, water temperatures, wind, forage fish abundance and brood stock size (numerous authors in review by Colby et al 1979). "Fluctuations in the success of natural reproduction are usually similar in most lakes in any area (Anon. 1957), suggesting the importance of climatic effects on year class abundance" (Colby et al 1979). Busch et al (1975) found that mean daily water temperature increase during spawning and incubation was strongly correlated to the abundance of young-of-the-year walleye in western Lake Erie from 1960 to 1970. Similar to the Cranberries, Simonhouse and Elbow lakes, exceptional year classes of Lake Erie walleye were recorded in 1962 and 1970. Although Busch et al (1975) found high rates of water temperature increase in both of these years, the year classes were "disproportionately strong". They found that water levels, brood stock size, and the intensity and frequency of strong winds could not be correlated directly to year class strengths. Although climate appears to be an important determinant of reproductive success for walleye in Simonhouse, the Cranberries and Elbow lakes, it is evident that a combination of a number of variables, both environmental and biological, govern the success of spawning, egg incubation and larval survival. Success at each stage is critical to the establishment of strong year classes.

SUMMARY AND CONCLUSIONS

All conclusions and recommendations have been made in consultation with B. Wright, Northern Region Fisheries Manager.

1) CPUE of walleye in Simonhouse and the Cranberry lakes was <5 fish · stand, $gang^{-1} \cdot 16h^{-1}$, but approximately 13 in Elbow Lake.(Table 4).

2) CPUE of pike was <8 in the Cranberry lakes, but 12 in Simonhouse Lake and 14 in Elbow Lake.

3) CPUE of lake trout was highest in Second Cranberry Lake at 1.4 but <0.1 in First Cranberry and Elbow lakes.

4) CPUE statistics substantiate recent (1975 to present) reports from anglers and lodge owners that during the summer angler success for walleye and pike in Elbow Lake is greater than in Simonhouse and the Cranberry lakes.

5) (a) Comparision of 1980/81 data with previous netting surveys in 1975/76 indicated species composition and CPUE of walleye had not changed significantly in the Cranberry lakes, but had decreased by half from 1976 to 1981 in Simonhouse Lake.

   (b) Species composition and CPUE of pike increased in Simonhouse and the Cranberry lakes from 1975/76 to 1980/81.

(c) Abundances of lake trout in Second Cranberry Lake has not changed significantly from 1975/76 to 1980/81.

6) (a) Comparison of earlier creel census surveys substantiates reports by anglers and lodge owners that angler success for primarily walleye has declined on the Cranberry lakes. Decreases in angler success since 1970 are believed due to intensive exploitation of walleye during the 1950's and 1960's.

(b) Angler CPUE of pike and lake trout have not changed significantly from 1958 to 1976.

7) It is concluded that Simonhouse and the Cranberry lakes offer moderate quality angling for walleye, pike and lake trout. It appears that annual angler harvests since 1976 have not decreased the relative and absolute abundances of walleye, pike or lake trout in the Cranberry lakes (Table 16). Concentrated angling during the spring at Simonhouse Narrows and First Cranberry Lake may have caused the decrease in walleye abundance in Simonhouse Lake from 1976 to 1981.

8) It is believed that continued exploitation of Simonhouse and the Cranberry lakes at the present harvest levels will, at best, only maintain the walleye, pike and lake trout stocks at their present abundances.

9) Higher CPUE of walleye and pike in the experimental nets in Elbow Lake in comparison to the Cranberry lakes substantiates reports of higher angler success of these species in Elbow Lake.

10) Elbow Lake may be subjected to greater exploitation as anglers shift away from Simonhouse and the Cranberry lakes. This could decrease significantly the abundances of pike and walleye.

RECOMMENDATIONS

1) If an improvement in angling success for walleye on Simonhouse and the Cranberry lakes was desirable, it would be necessary to impose restrictions on the present annual walleye harvests. These restrictions could include one or a combination of the following: reduced possession limits, minimum and/or maximum size limits, and a shorter open angling season.

2) The present annual angling harvest for Elbow Lake should be estimated by a creel census. This should be followed by further experimental gill netting in four or five years to determine how the estimated angler exploitation rate has affected the abundance of pike and walleye. If it was found that a) based on the creel census, annual combined angling harvests of walleye and pike were greater than 57% of the predicted maximum sustainable yield, or, b) the CPUE of walleye and/or pike in standard gang gill nets had declined dramatically four or five years after the 1981 survey, then angling restrictions would be required to protect and sustain a higher quality of angling in Elbow Lake.

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Appendix 1. Commercial fish production from Simonhouse Lake, in pounds.

Year	Season	Number of Licences	Walleye (cwt)	Pike (cwt)	Lake Trout (cwt)	Whitefish (cwt)	Cisco (cwt)	Sucker (cwt)	Total Production (cwt)
1931-32	Winter	3	26		19	308			353
1932-33	"	2	18		12	56			86
1933-34	"	1	3	30	2	40		20	95
1934-35	"	2	7	40	6	88			141
1936-37	"	5	64		40	380			484
1937-38	"	1	30	100	35	55		4	224
1938-39	"	2		8		48			56
1939-40	"	5	17	22	22	81			142
1940-41	"	6	60	84	40	250			434
1941-42	"	3	19	14	15	127			175
1942-43	"	2	13	58	10	71	4	5	161
1943-44	"	6	16	161	25	201	7		410
1944-45	"	5	82	167	24	150			423
1945-46	"	1	10	20	1	20	1		52
1946-47	"	7	103	135	5	19	43		305
1947-48	"	6	132	220	2	43	53		450
1948-49	"	3	66	109		3	70	54	302
1949-50	"	9	63	206	4	8	21		302
1950-51	"	1	23	37	1				61
1951-52	"	2	44	107	17	14	18		200
1955-56	"	2	3	38	6	32		41	120
1956-57	"	4	57	80	39	139		68	383
1957-58	"	5	73	180	47	448	57		805
1958-59	"	9	66	149	16	657	95		983
1959-60	"	5	99	142	2	250	73		566
1960-61	"	10	95	306	2	302	204		909
1961-62	"	7	106	195	13	225	109		648
1962-63	"	5	44	63	1	50	30		188
1963	Fall	4	67	48	3	249	4		371
1964	Fall	4	32	101	2	85	6		226
1965	Fall	4	7	8		12			27
1965-66	Winter	4	1	14	2	3			20
1966-67	Winter	3	2	81	7	18			108
1967	Fall	3	16	41	3	29			89

Appendix 2. Water chemistry of stations 1 - 3 in First, Second and Third Cranberry lakes, August 14, 1980.

Parameter	First Cranberry			Second Cranberry			Third Cranberry		
	1	2	3	1	2	3	1	2	3
Conductivity ($\mu mho \cdot cm^{-1}$)	206.	206.	207.	206.	207.	205.	192.	191.	192.
Total dissolved solids ($mg \cdot l^{-1}$)	140.	150.	120.	120.	120.	130.	120.	120.	130.
Total suspended solids ($mg \cdot l^{-1}$)	< 5.	< 5.	< 5.	< 5.	< 5.	< 5.	< 5.	< 5.	< 5.
Hardness ($CaCO_3$) ($mg \cdot l^{-1}$)	99.	104.	104.	104.	104.	104.	99.	104.	104.
Total alkalinity ($CaCO_3$) ($mg \cdot l^{-1}$)	110.	92.	108.	106.	108.	112.	100.	100.	100.
pH	8.40	8.35	8.45	8.40	8.30	8.39	8.35	8.50	8.45
Ca - extractable ($mg \cdot l^{-1}$)	18.	20.	20.	20.	20.	20.	18.	20.	20.
Mg - extractable ($mg \cdot l^{-1}$)	13.	13.	13.	13.	13.	13.	13.	13.	13.
K - extractable ($mg \cdot l^{-1}$)	< 2.	< 2.	< 2.	< 2.	< 2.	< 2.	< 2.	< 2.	< 2.
Na - extractable ($mg \cdot l^{-1}$)	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
Total organic carbon ($mg \cdot l^{-1}$)	15.5	14.5	14.0	13.0	15.0	13.0	15.0	14.5	14.5
Total inorganic carbon ($mg \cdot l^{-1}$)	24.5	24.5	24.0	24.0	25.0	25.0	22.5	22.5	22.5
$NO_3 - NO_2 - N$ dissolved ($mg \cdot l^{-1}$)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
P - total ($mg \cdot l^{-1}$)	0.02	0.02	0.02	0.02	< 0.02	< 0.02	0.02	0.02	0.02
Cl - soluble - ($mg \cdot l^{-1}$)	< 1.5	< 1.0	< 1.5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
SO_4 - soluble ($mg \cdot l^{-1}$)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Colour	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	5.0	< 5.0	5.0
Turbidity (NTU)	1.0	1.0	1.5	0.55	0.60	0.55	1.5	1.0	1.0

Appendix 3. Water chemistry analyses of stations 1 - 3 in Simonhouse (Aug. 14, 1980) and Elbow (June 9, 1981) lakes.

Parameter	Simonhouse			Elbow		
	1	2	3	1	2	3
Conductivity ($\mu mho \cdot cm^{-1}$)	296.	294.	266.	88.	85.	119.
Total dissolved solids ($mg \cdot l^{-1}$)	190.	180.	160.	70.	58.	70.
Total suspended solids ($mg \cdot l^{-1}$)	< 5.	< 5.	< 5.	<5.	<5.	< 5.
Hardness ($CaCO_3$) ($mg \cdot l^{-1}$)	165.	170.	145.	30.	23.	46.
Total alkalinity ($CaCO_3$) ($mg \cdot l^{-1}$)	162.	158.	146.	40.	37.	55.
pH	8.45	8.50	8.70	7.65	7.70	7.80
Ca - extractable ($mg \cdot l^{-1}$)	33.	30.	25.	8.	5.	10.
Mg - extractable ($mg \cdot l^{-1}$)	20.	23.	20.	<5.	<5.	< 5.
K - extractable ($mg \cdot l^{-1}$)	2.1	< 2.0	2.1	<2.0	<2.0	< 2.0
Na - extractable ($mg \cdot l^{-1}$)	<10.	<10.	<10.	<10.	<10.	<10.
Total organic carbon ($mg \cdot l^{-1}$)	14.5	12.5	14.0	14.0	14.5	14.0
Total inorganic carbon ($mg \cdot l^{-1}$)	37.0	37.0	33.0	8.5	8.5	12.5
NO_3 - NO_2 - N dissolved ($mg \cdot l^{-1}$)	< 0.01	< 0.01	< 0.01	0.03	0.06	< 0.01
P - total ($mg \cdot l^{-1}$)	< 0.02	< 0.02	< 0.02	0.05	0.06	0.06
Cl - soluble - ($mg \cdot l^{-1}$)	< 1.5	< 1.0	< 1.0	<2.0	<2.0	< 2.0
SO_4 - soluble ($mg \cdot l^{-1}$)	5.0	5.0	5.0	10.0	10.0	10.0
Colour	< 5.0	< 5.0	< 5.0	15.0	15.0	20.0
Turbidity (NTU)	1.5	1.5	1.5	1.0	1.5	2.0

Appendix 4. Catch summaries of experimental fishing sets from Simonhouse Lake, 1980.

Set Location	Date of Set	Whitefish	Cisco	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	June 5	1		9	7			15
2	June 5	1	1	13	4	5		20
3	June 6		1	3	2			17
4	June 7	1	5	10	7	15		8
5	June 7	3	11	12	9			2
6	June 8	5	7	10	11			22
7	June 8	2	2	7				4
8	June 8	1	1	10	1	3		1
9	June 8	3	4	10	3			2
10	June 8	1	10	21	1			21
11	June 10		2	19				4
12	June 10		3	5		1		
13	June 10	1	3	8	2	1		14
14	June 11	13	11	16	5			24
15	June 11	9	19	7	5			19
16	June 12	22	16	14	1	3		44
17	June 12	2	2	7	4			3
18	June 13	4	4	22				7
19	June 13	4	6	15	2	1		22
20	June 14	2	1	5	5			20
21	June 14	2		8	2			22
22	June 15	5	12	13	6			12
23	June 15	14	32	12	7	3	1	14
24	June 17	4	12	9	3	3	2	4
Total Caught		100	165	265	87	35	3	321
Total Aged		98	-	257	85	-	-	-

Appendix 5. Catch summaries of experimental fishing sets from Simonhouse Lake, 1981.

Set Location	Date of Set	Whitefish	Cisco	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	June 2	3	3	16	23	1		21
2	June 2			12	6	2		19
3	June 2	2	3	8	3	2		22
4	June 3	13	5	20	11	6		32
5	June 3	30	2	21	8	1		42
6	June 6	5	5	20	6	3	1	43
7	June 6	8	3	20	3	1		42
Total Caught		61	21	117	60	16	1	221
Total Aged		61	-	112	59	-	-	-

Appendix 6. Catch summaries of experimental fishing sets from First Cranberry Lake, 1980 and 1981.

Set Location	Date of Set	Whitefish	Cisco	Lake Trout	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	Aug. 8/80		17		4	2			
2	Aug. 8/80		6		3	1	3		8
3	Aug. 9/80	1	42		4	9	8		7
4	Aug. 9/80		22		3		17		3
5	Aug.10/80		18		3	9	25		7
6	Aug.10/80		5		6	3	8		8
7	Aug.11/80		18		2	1	5		
8	Aug.11/80		29		5	3	28		6
1	June 5/81	3	14		17	7	18	1	19
2	June 5/81	3	3		16	4	26		16
3	June 7/81	5	34	1	13	10	1	3	7
4	June 7/81	4	32		11	4	7	1	5
Total Caught		16	240	1	87	53	146	5	86
Total Aged		16	-	-	85	51	-	-	-

Appendix 7. Catch summaries of experimental fishing sets in Second Cranberry Lake, 1980 and 1981.

Set Location	Date of Set	Whitefish	Cisco	Lake Trout	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	Aug. 12/80	7	27	7				1	
2	Aug. 12/80		1		1	1			
3	Aug. 13/80	5	7	3				1	
4	Aug. 13/80		4		1	8			8
5	Aug. 14/80	58	49	4				1	2
6	Aug. 14/80	1	2		7	18			32
7	Aug. 15/80	4	10	3				1	
8	Aug. 15/80	1	1		1	3			1
9	Aug. 16/80	1	8		1	3			8
10	Aug. 16/80		20		6	9			8
1	May 31/81	6	5	1					7
2	May 31/81	6	1	1				1	3
3	June 1/81	7	3	1				2	15
4	June 4/81	2	1		2				19
5	June 4/81	12		1					10
Total Caught		110	139	21	19	42		7	113
Total Aged		107	-	20	16	40		-	-

Appendix 8. Catch summaries of experimental fishing sets in Third Cranberry Lake, 1980 and 1981.

Set Location	Date of Set	Whitefish	Cisco	Lake Trout	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	Aug. 17/80		7		1	1	13		1
2	Aug. 18/80	17	43		3	7			4
3	Aug. 19/80	10	39		3	25	8		1
4	Aug. 19/80	4	67		2	1	3		1
5	Aug. 21/80	3	68		1	3	1		4
6	Aug. 21/80	4	21		1	3			2
1	May 28/81	18	39	2	4				12
2	May 28/81		22		9	2	13	2	5
3	May 29/81		32		15	1	3		10
4	May 29/81	18	53	1	1			2	7
5	May 29/81	6	29		10			4	18
6	May 30/81	61	29		14	1	1	2	20
Total Caught		141	449	3	65	44	42	10	84
Total Aged		138		3	63	41			

Appendix 9. Catch summaries of experimental fishing sets from Elbow Lake, 1981.

Set Location	Date of Set	Whitefish	Cisco	Lake Trout	Pike	Walleye	Yellow Perch	Burbot	White Sucker
1	May 29	7	19		10	2	1	3	4
2	May 29	6	39		8	5	2	2	6
3	May 29	4	8		14	15	4		22
4	May 30		10		14	14	2		16
5	May 30	6	41		25	10	5	1	17
6	May 30	9	41		13	2	2	2	2
7	May 31	10	52		12	3	2		8
8	May 31	13	37		16	6	2		2
9	June 1	9	15		15	4	4	2	4
10	June 1	6	3		49	24	12		13
11	June 1	21	46	1	18	15	3		7
12	June 2	3	28		10	11	5	1	6
13	June 2	5	48		22	12	1		2
14	June 4	6	26		6	3	2		13
15	June 4	5	43		17	16	6	2	14
16	June 5	2	28		9	19	1		20
17	June 5	1	24		5	13		1	2
18	June 6	2	24		12	24	1		9
19	June 6	2	4		12	20	3		8
20	June 6	6	2		2	42			1
Total Caught		123	538	1	289	260	58	14	176
Total Aged		122	-	-	287	260	-	-	-

Appendix 10. Mesh size effects on walleye catches in Simonhouse Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	17	33	29	32(1)	23	10(2)	144(3)
CPUE*(no./23m/16 h)	0.55	1.06	0.94	1.06	0.74	0.39	0.79
CPUE*(kg/23m/16 h)	0.57	0.94	1.06	1.36	1.11	0.64	0.94
Mean length (mm)	435.18	417.03	450.79	494.56	506.61	529.60	465.33
Mean weight (g)	1038.82	883.64	1137.59	1274.38	1494.78	1666.00	1191.88
% Immature	35.29	45.45	31.03	15.62	8.70	0	25.69
Mean age (yrs.)	7.18	6.67	8.24	9.50	10.30	14.70	8.81
	Frequencies (%)						
Age							
3	17.65	6.06	6.90				4.86
4	11.76	27.27	17.24	6.25	8.70		13.89
5	17.65	15.15	13.79	12.50	4.35	10.00	12.50
6	5.88	9.09	3.45	9.38		10.00	6.25
7		3.03	3.45		4.35		2.08
8	11.76	12.12	10.34	15.63	21.74		13.19
9	5.88		17.24	18.75	4.35		9.03
10	17.65	18.18	17.24	9.38	21.74	10.00	15.97
11	5.88	3.03			13.04		5.56
12		3.03		3.13	4.35		2.08
13		3.03		3.13		10.00	2.08
14				3.13		10.00	1.39
17				3.13	8.70		2.08
18	5.88		3.45	3.13		10.00	2.78
19					4.35	10.00	1.39
20					4.35	20.00	2.08
21			3.45				0.69
22			3.45			10.00	1.39
27				3.13			0.69

* Total effort of each mesh was 713 m (31 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 11. Mesh size effects on walleye catches in First Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	8	6	9	7	13(1)	8(1)	51(2)
CPUE*(no./23m/16 h)	0.67	0.50	0.75	0.58	1.17	0.75	0.74
CPUE*(kg/23m/16 h)	0.99	0.87	1.21	0.84	2.41	1.48	1.29
Mean length (mm)	501.25	547.33	527.56	498.00	565.38	566.75	537.49
Mean weight (g)	1480.00	1740.00	1606.67	1431.43	2063.08	1970.00	1751.76
% Immature	25.00	0	22.22	14.29	7.69	0	11.76
Mean age (yrs.)	11.00	13.33	10.33	7.71	11.08	13.25	11.08
	Frequencies (%)						
Age							
4	12.50		22.22	28.57			9.80
5	25.00			28.57	7.69		9.80
6		16.67			7.69		3.92
8		16.67	22.22	14.29	7.69	37.50	15.69
9	12.50		22.22	14.29	15.38		11.76
10	12.50				23.08		7.84
11			11.11		7.69	12.50	5.88
12						12.50	1.96
13		16.67					1.96
15		16.67			15.38		5.88
17					7.69		1.96
18	25.00						3.92
19	12.50	33.33	11.11	14.29	7.69	25.00	15.69
21			11.11			12.50	3.92

* Total effort of each mesh was 276 m (12 sets x 23 m)

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 12. Mesh size effects on walleye catches in Second Cranberry Lake, 1980.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	8	3	7	9(2)	10	3	40(2)
CPUE*(no./23m/16 h)	0.53	0.20	0.47	0.73	0.67	0.20	0.47
CPUE*(kg/23m/16 h)	0.51	0.21	0.60	1.19	1.14	0.32	0.66
Mean length (mm)	408.25	431.33	489.71	523.78	539.00	517.33	491.10
Mean weight (g)	947.50	1063.33	1280.00	1625.56	1706.00	1586.67	1404.50
% Immature	62.50	66.67	14.29	11.11	0	0	22.50
Mean age (yrs.)	5.75	6.67	8.29	9.56	9.20	8.00	8.15
	Frequencies (%)						
Age							
3	37.50	33.33					10.00
5	25.00		14.29	22.22			12.50
6			28.57		10.00		7.50
7		33.33	14.29	11.11		33.33	10.00
8	12.50		28.57	22.22	30.00	33.33	22.50
9	12.50				40.00	33.33	15.00
10	12.50	33.33		11.11	10.00		10.00
12				11.11			2.50
13				11.11			2.50
16					10.00		2.50
18			14.29	11.11			5.00

* Total effort of each mesh was 345 m (15 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 13. Mesh size effects on walleye catches in Third Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	3	2	9(1)	12	13	4	43
CPUE*(no./23m/16 h)	0.25	0.17	0.83	1.00	1.08	0.33	0.61
CPUE*(kg/23m/16 h)	0.12	0.15	0.83	1.22	1.61	0.71	0.78
Mean length (mm)	291.33	407.00	437.56	479.83	504.31	573.50	470.56
Mean weight (g)	460.00	875.00	995.56	1216.67	1488.08	2147.50	1270.35
% Immature	66.67	50.00	44.44	8.33	0	0	19.51
Mean age (yrs.)	2.00	4.50	6.22	8.58	7.61	9.00	7.63
	Frequencies (%)						
Age							
1	66.67						4.65
4	33.33	50.00	22.22	8.33			11.63
5		50.00	22.22	16.67	23.08		18.60
6			33.33	16.67	30.77		20.93
7					7.69	25.00	4.65
8				16.67	23.08		11.63
9				16.67			4.65
10			22.22			25.00	6.98
11				8.33			2.33
13				8.33			2.33
14					7.69		2.33
15					7.69		2.33
19				8.33		50.00	6.98

* Total effort of each mesh was 276 m (12 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 14. Mesh size effects on walleye catches in Elbow Lake, 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	38	46	71	54	43	8	260
CPUE*(no./23m/16 h)	1.90	2.30	3.55	2.70	2.15	0.40	2.17
CPUE*(kg/23m/16 h)	0.98	1.43	3.09	2.24	2.16	0.45	1.72
Mean length (mm)	341.24	366.52	419.92	415.89	442.00	449.75	402.70
Mean weight (g)	517.63	620.43	870.99	829.07	1005.49	1116.25	796.10
% Immature	57.89	45.65	25.35	20.37	30.23	25.00	33.46
Mean age (yrs.)	7.19	7.47	9.29	9.69	10.46	10.37	8.98
	Frequencies (%)						
Age							
1	5.55						0.79
2	8.33	4.44					1.97
3		4.44					0.79
4	11.11	15.56	1.43	3.85			5.51
5	13.89	6.67	4.29		2.33		4.72
6	13.89	11.11	21.43	21.15	11.63	25.00	16.93
7		20.00	15.71	15.38	11.63	12.50	13.39
8	16.67	4.44	12.86	7.69	6.98		9.45
9	13.89	15.56	8.57	11.54	13.95	12.50	12.21
10	2.78	2.22			4.65		1.57
11	2.78	2.22	12.86	9.61	18.60	12.50	9.84
12		2.22	1.43	3.85	2.33		1.97
13			4.29	3.85	2.33		2.36
14	2.78	4.44		9.61	11.63	12.50	5.51
15	2.78	4.44	12.86	7.69	11.63	25.00	9.05
16				3.85			0.79
17			1.43				0.39
18	2.78		2.86				1.18
19	2.78						0.39
20		2.22					0.39
21				1.92			0.39
24					2.33		0.39

* Total effort of each mesh was 460 m (20 sets x 23 m).

Appendix 15. Mesh size effects on pike catches in Simonhouse Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	74	70(2)	114(6)	59(2)	46(3)	6	369(13)
CPUE*(no./23m/16 h)	2.39	2.32	3.87	1.97	1.58	0.19	2.05
CPUE*(kg/23m/16 h)	3.15	4.02	6.27	4.37	3.98	0.73	3.75
Mean length (mm)	522.47	585.06	586.70	639.59	676.87	727.67	595.50
Mean weight (g)	1320.00	1730.29	1619.30	2218.98	2520.22	3786.67	1823.77
% Immature	33.78	17.14	11.40	13.56	0	16.67	15.99
Mean age (yrs.)	5.38	6.30	6.34	7.22	7.20	8.33	6.42
	Frequencies (%)						
Age							
1	2.70						0.54
2	8.11	1.43	0.88				2.17
3	10.81	4.29	1.75		4.35		4.07
4	17.57	11.43	12.28	1.69	6.52		10.57
5	12.16	18.57	21.05	15.25	4.35	16.67	15.72
6	16.22	17.14	20.18	25.42	17.39		18.97
7	16.22	22.86	21.05	23.73	19.57	16.67	20.60
8	9.46	12.86	9.65	15.25	26.09	16.67	13.28
9	2.70	5.71	7.02	6.78	13.04	33.33	7.05
10	2.70	4.29	4.39	1.69	4.35		3.52
11		1.43	0.88	5.08	4.35		1.90
12			0.88	1.69		16.67	0.81
13	1.35			3.39			0.81

* Total effort of each mesh was 713 m (31 sets x 23 m)

( ) Additional fish that were not sampled and were only included with the number caught in CPUE calculations.

Appendix 16. Mesh size effects on pike catches in First Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	16(1)	12(1)	28	13	11	5	85(2)
CPUE*(no./23m/16 h)	1.42	1.08	2.33	1.08	0.92	0.42	1.21
CPUE*(kg/23m/16 h)	2.31	1.58	4.12	1.74	2.10	1.44	2.23
Mean length (mm)	593.13	570.50	596.71	529.62	633.45	726.40	606.68
Mean weight (g)	1632.50	1455.00	1765.00	1612.31	2296.36	3464.00	1841.65
% Immature	6.25	0	7.14	0	0	0	3.53
Mean age (yrs.)	5.19	4.92	5.29	5.08	6.54	8.00	5.51
	Frequencies (%)						
Age							
2		8.33					1.18
3			14.29				4.71
4	25.00	25.00	17.86	23.08	9.09		18.82
5	43.75	33.33	32.14	46.15	27.27		34.12
6	18.75	25.00	21.43	30.77	36.36		23.53
7	12.50	8.33	3.57			20.00	5.88
8			3.57		9.09	60.00	5.88
9						20.00	1.18
10			7.14		9.09		3.53
11					9.09		1.18

* Total effort of each mesh was 276 m (12 sets x 23 m)

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 17. Mesh size effects on pike catches in Second Cranberry Lake, 1980.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	0	7	3(2)	3	2	1(1)	16(3)
CPUE*(no./23m/16 h)		0.47	0.33	0.20	0.13	0.13	0.21
CPUE*(kg/23m/16 h)		0.52	0.46	0.28	0.30	0.26	0.30
Mean length (mm)		508.57	573.33	589.33	666.00	702.00	567.63
Mean weight (g)		1111.43	1366.67	1420.00	2270.00	1950.00	1414.38
% Immature		42.86	0	33.33	0	0	25.00
Mean age (yrs.)		5.14	5.33	6.00	6.50	8.00	5.69
	Frequencies (%)						
Age							
3		28.57					12.50
4		28.57					12.50
5			66.67	66.67			25.00
6		14.29	33.33		50.00		18.75
7		14.29			50.00		12.50
8				33.33		100.00	12.50
9		14.29					6.25

* Total effort of each mesh was 345 m (15 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 18. Mesh size effects on pike catches in Third Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	10	18(1)	20(1)	7	5	3	63(2)
CPUE*(no./23/16 h)	0.83	1.58	1.75	0.58	0.42	0.25	0.90
CPUE*(kg/23/m16 h)	1.07	1.07	2.22	1.44	0.81	0.79	1.24
Mean length (mm)	553.40	423.89	544.00	678.00	651.20	733.33	543.59
Mean weight (g)	1282.00	676.67	1268.00	2470.57	1952.00	3140.00	1378.32
% Immature	20.00	61.11	20.00	0	0	0	26.98
Mean age (yrs.)	4.90	3.44	4.35	7.14	4.80	9.00	4.75
	Frequencies (%)						
Age							
2		33.33					9.52
3	20.00	38.89	25.00				19.05
4	30.00	5.56	60.00	14.29	40.00		30.16
5	10.00	5.56	10.00	14.29	40.00		11.11
6	30.00	5.56	10.00	14.29	20.00	33.33	14.29
7		11.11		14.29			4.76
8	10.00		5.00	28.57		33.33	7.94
12				14.29			1.59
13						33.33	1.59

* Total effort of each mesh was 276 m (12 sets x 23 m)

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 19. Mesh size effects on pike catches in Elbow Lake, 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	53(1)	57	79	63(1)	26	9	287(2)
CPUE*(no./23m/16 h)	2.70	2.85	3.95	3.20	1.30	0.45	2.41
CPUE*(kg/23m/16 h)	3.83	3.48	5.28	5.06	2.26	1.12	3.50
Mean length (mm)	537.72	510.16	558.38	578.13	615.08	687.78	558.52
Mean weight (g)	1416.79	1221.05	1336.15	1582.06	1740.38	2492.22	1455.04
% Immature	26.41	22.81	8.86	20.63	0	11.11	16.72
Mean age (yrs.)	5.75	5.25	5.81	6.27	6.69	8.00	5.94
	Frequencies (%)						
Age							
2	7.69	12.28		4.76			4.88
3	9.61	14.04		3.17			5.23
4	11.54	17.54	20.25	9.52		11.11	13.59
5	15.38	12.28	26.58	12.70	11.54		16.38
6	17.31	14.04	24.05	28.57	38.46		22.30
7	17.31	12.28	18.99	14.29	26.92	33.33	17.42
8	13.46	8.77	5.06	14.29	15.38	22.22	10.80
9	5.77	3.51	1.27	7.94	7.69	22.22	5.23
10		3.51	3.80	3.17			2.44
11		1.75		1.59			0.70
12	1.92						0.35
13						11.11	0.35

* Total effort of each mesh was 460 m (20 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 20. Mesh size effects on whitefish catches in Simonhouse Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	11	28	27	27	37(1)	29(1)	159(2)
CPUE*(no./23m/16 h)	0.35	0.90	0.87	0.87	1.23	0.97	0.87
CPUE*(kg/23m/16 h)	0.38	0.89	0.82	0.86	1.41	1.11	0.91
Mean length (mm)	411.09	406.64	405.56	413.33	430.76	430.76	417.29
Mean weight (g)	1078.18	985.00	941.48	983.70	1149.31	1149.31	1042.14
% Immature	0	10.71	11.11	3.70	5.40	3.45	6.29
Mean age (yrs.)	12.73	14.32	13.52	15.67	15.50	16.03	14.89
	Frequencies (%)						
Age							
5			3.70				0.63
6		3.57					0.63
8	9.09	3.57	7.41				2.50
9	9.09	7.14	7.41	3.70	5.26		5.00
10	9.09	3.57	7.41	14.81			5.00
11	18.18	3.57	11.11	7.41	13.16	6.90	9.38
12	9.09	7.14	11.11	14.81	7.89		8.13
13		3.57	7.41		7.89	13.79	6.25
14	18.18	14.29	3.70	3.70	7.89	17.24	10.00
15	9.09	3.57	7.41		18.42	10.34	8.75
16		17.86	7.41	3.70	2.63	13.79	8.13
17		14.29	7.41	7.41	5.26	10.34	8.13
18	18.18	10.71	3.70	18.52	13.16	6.90	11.25
19		7.14	3.70	11.11	5.26		5.00
20				3.70	2.63	10.34	3.13
21			7.41		5.26	3.45	3.13
22			3.70	3.70		6.90	2.50
23				3.70			0.63
26					2.63		0.63
28				3.70	2.63		1.25

* Total effort of each mesh was 713 m (31 sets x 23 m)

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 21. Mesh size effects on whitefish catches in First Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	0	1	5	2	2	6	16
CPUE*(no./23m/16 h)		0.08	0.42	0.17	0.17	0.50	0.22
CPUE*(kg/23m/16 h)		0.04	0.25	0.20	0.17	0.53	0.20
Mean length (mm)		330.00	354.00	436.00	421.00	428.67	399.25
Mean weight (g)		500.00	600.00	1200.00	990.00	1060.00	890.00
% Immature		100.00	60.00	0	0	0	25.00
Mean age (yrs.)		10.00	12.20	14.50	13.50	18.00	14.69
	Frequencies (%)						
Age							
8			20.00				6.25
9			40.00				12.50
10		100.00					6.25
12			20.00		50.00		12.50
13				50.00			6.25
15					50.00	16.67	12.50
16				50.00		33.33	18.75
18						16.67	6.25
19						16.67	6.25
23			20.00				6.25
24						16.67	6.25

* Total effort of each mesh was 276 m (12 sets x 23 m)

Appendix 22. Mesh size effects on whitefish catches in Second Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	1	15	26(2)	25(1)	21	19	107(3)
CPUE*(no./23m/16 h)	0.07	1.00	1.87	1.73	1.40	1.27	1.22
CPUE*(kg/23m/16 h)	0.06	0.38	1.27	1.26	1.22	1.31	0.92
Mean length (mm)	408.00	294.13	365.31	383.52	408.48	423.68	378.82
Mean weight (g)	860.00	385.33	679.23	728.40	874.76	1032.63	752.34
% Immature	0	80.00	38.46	16.00	19.05	5.26	28.04
Mean age (yrs.)	15.00	8.80	11.73	13.40	14.09	16.74	13.09
	Frequencies (%)						
Age							
3		13.33	3.85				2.80
5		20.00					2.80
6		13.33		4.00			2.80
7		13.33	11.54	4.00			5.61
8		6.67	19.23	4.00		5.26	7.48
9			3.85	12.00	9.52	5.26	6.54
10			15.38		4.76	5.26	5.61
11		6.67	3.85	16.00	14.29	5.26	9.35
12			7.69	8.00	14.29	10.53	8.41
13			7.69	16.00		10.53	7.48
14		6.67	3.85	12.00	9.52		6.54
15	100.00				19.05		4.67
16		6.67	3.85		9.52	5.26	4.67
17		6.67		8.00	4.76		3.74
18			7.69		4.76	5.26	3.74
19		6.67	3.85		4.76	5.26	3.74
20			3.85	4.00		15.79	4.67
21				4.00		5.26	1.87
22						10.53	1.87
23				4.00			0.93
25					4.76	5.26	1.87
26			3.85				0.93
27				4.00		5.26	1.87

* Total effort of each mesh was 345 m (15 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 23. Mesh size effects on whitefish catches in Third Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	7(1)	8(1)	19	38	47	19(1)	138(3)
CPUE*(no./23m/16 h)	0.67	0.75	1.58	3.17	3.92	1.67	1.96
CPUE*(kg/23m/16 h)	0.39	0.47	1.00	2.00	2.99	1.42	1.38
Mean length (mm)	357.71	358.50	363.47	359.71	385.23	402.42	374.63
Mean weight (g)	588.57	628.75	628.95	630.53	762.89	853.68	703.88
% Immature	0	25.00	10.53	15.79	6.38	0	9.42
Mean age (yrs.)	14.43	13.25	13.84	14.24	15.94	17.16	15.26
	Frequencies (%)						
Age							
5				2.63			0.72
6		12.50	10.53				2.17
7		12.50		7.89	4.26		4.35
8				5.26	4.26		2.90
9	14.29		5.26				1.45
10	14.29			7.89		5.26	3.62
11		12.50	21.05	2.63	4.26	10.53	7.25
12		12.50	10.53	10.53	8.51	5.26	8.70
13	14.29	12.50	5.26	13.16	4.26	10.53	8.70
14	14.29		5.26	13.16	8.51		7.97
15	14.29		5.26	2.63	4.26		3.62
16	14.29		10.53	2.63	8.51		5.80
17				2.63	4.26	26.32	5.80
18		12.50	10.53	5.26	12.77	5.26	8.70
19		12.50		5.26	14.89	5.26	7.97
20		12.50	5.26	2.63	4.26	5.26	4.35
21			5.26	7.89	6.38	5.26	5.80
22				2.63	4.26	10.53	3.62
23			5.26		4.26		2.17
24	14.29			5.26		5.26	2.90
25					2.13	5.26	1.45

* Total effort of each mesh was 276 m (12 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 24. Mesh size effects on whitefish catches in Elbow Lake, 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	10	13(1)	30	32	26	11	122(1)
CPUE*(no./23m/16 h)	0.50	0.70	1.50	1.60	1.30	0.55	1.03
CPUE*(kg/23m/16 h)	0.32	0.51	0.99	1.09	1.00	0.48	0.73
Mean length (mm)	348.30	354.31	350.93	361.31	377.77	390.36	363.07
Mean weight (g)	641.00	721.54	659.67	684.38	770.38	881.82	714.84
% Immature	10.00	23.08	16.67	18.75	38.46	9.09	13.93
Mean age (yrs.)	10.89	11.31	12.10	13.84	15.11	16.30	13.39
	Frequencies (%)						
Age							
3							0.84
5		7.69					1.68
6		15.38					1.68
7			6.67				4.20
9			10.00		3.85	10.00	13.44
10	44.44	15.38	13.33	19.35			12.60
11	33.33		16.67	9.68	11.54	10.00	6.72
12		7.69	3.33	16.13	3.85		5.88
13			10.00	6.45	7.69		10.92
14	11.11	7.69	16.67	3.22	15.38	10.00	10.92
15		15.38	6.67	12.90	11.54	20.00	4.20
16		23.08		3.22	3.85		5.04
17			3.33	6.45	7.69	10.00	1.68
19				3.22		10.00	6.72
20	11.11	7.69		3.22	19.23		3.36
21			3.33	3.22	7.69		2.52
22			3.33	3.22	3.85		0.84
23						10.00	1.68
24			3.33	3.22			1.68
25			3.33		3.85		1.68
				6.45		20.00	3.36

* Total effort of each mesh was 460 m (20 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 25. Mesh size effects on lake trout catches in Second Cranberry Lake, 1980 and 1981.

	Mesh Size (cm)						
	3.8	5.1	7.6	9.5	10.8	12.7	All meshes
Number caught	4(1)	8	1	2	3	2	20(1)
CPUE*(no./23m/16 h)	0.33	0.53	0.07	0.13	0.20	0.13	0.23
CPUE*(kg/23m/16 h)	0.28	0.46	0.49	0.48	1.32	0.35	0.58
Mean length (mm)	362.00	329.75	788.00	629.00	776.00	566.00	479.60
Mean weight (g)	845.00	861.25	7300.00	3620.00	6593.33	2650.00	2494.50
% Immature	75.00	87.50	0	0	0	0	50.00
Mean age (yrs.)	8.50	6.87	21.00	13.00	19.00	13.50	11.00
	Frequencies (%)						
Age							
4	25.00	25.00					15.00
5		12.50					5.00
6		25.00					10.00
7		25.00		50.00			15.00
9	50.00						10.00
10						50.00	5.00
12	25.00						5.00
14					33.33		5.00
16		12.50					5.00
17						50.00	5.00
18					33.33		5.00
19				50.00			5.00
21			100.00				5.00
25					33.33		5.00

* Total effort of each mesh was 345 m (15 sets x 23 m).

( ) Additional fish that were not sampled, and were only included with the number caught in CPUE calculations.

Appendix 26. Age-specific mean lengths, weights and condition factors for Simonhouse Lake walleye, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
3	5	7.58	283.60	228.00	1.00	2	2.56	246.00	150.00	0.98	7	4.86	272.86	205.71	0.99
4	5	7.58	348.00	436.00	1.02	15	19.23	343.73	460.00	1.03	20	13.89	344.80	454.00	1.03
5	12	18.18	404.42	601.67	0.97	6	7.69	431.00	960.00	1.00	18	12.50	413.28	721.11	0.98
6	4	6.06	384.00	610.00	1.07	5	6.41	489.60	1252.00	1.03	9	6.25	442.67	966.67	1.05
7	-	-	-	-	-	3	3.85	501.33	1303.33	1.04	3	2.08	501.33	1303.33	1.04
8	8	12.12	481.25	1177.50	1.06	11	14.10	491.45	1254.55	1.04	19	13.19	487.16	1222.11	1.05
9	7	10.61	481.14	1271.43	1.14	6	7.69	511.67	1393.33	1.05	13	9.03	495.23	1327.69	1.10
10	8	12.12	469.00	1095.00	1.06	15	19.23	517.33	1577.33	1.12	23	15.97	500.52	1409.57	1.10
11	4	6.06	494.50	1355.00	1.11	4	5.13	564.50	1770.00	0.98	8	5.56	529.50	1562.50	1.05
12	1	1.52	528.00	1600.00	1.09	2	2.56	534.00	1780.00	1.15	3	2.08	532.00	1720.00	1.13
13	2	3.03	577.00	1940.00	1.01	1	1.28	600.00	2080.00	0.96	3	2.08	584.67	1986.67	0.99
14	2	3.03	490.00	1540.00	1.34	-	-	-	-	-	2	1.39	490.00	1540.00	1.34
17	3	4.55	542.00	1860.00	1.15	-	-	-	-	-	3	2.08	542.00	1860.00	1.15
18	-	-	-	-	-	4	5.13	640.00	2595.00	0.98	4	2.78	640.00	2595.00	0.98
19	-	-	-	-	-	2	2.56	641.00	2730.00	1.03	2	1.39	641.00	2730.00	1.03
20	2	3.03	555.00	1780.00	1.04	1	1.28	634.00	2620.00	1.03	3	2.08	581.33	2060.00	1.03
21	1	1.52	550.00	1820.00	1.09	-	-	-	-	-	1	0.69	550.00	1820.00	1.09
22	1	1.52	540.00	1600.00	1.02	1	1.28	660.00	3380.00	1.18	2	1.39	600.00	2490.00	1.10
27	1	1.52	540.00	1520.00	0.97						1	0.69	540.00	1520.00	0.97

Appendix 27. Age-specific mean lengths, weights and condition factors for First Cranberry Lake walleye, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
4	3	14.29	400.67	726.67	1.21	2	6.67	423.00	750.00	0.99	5	9.80	409.60	736.00	1.07
5	2	9.52	446.00	940.00	1.06	3	10.00	487.33	1446.67	1.14	5	9.80	470.80	1244.00	1.11
6	2	9.52	455.00	1020.00	1.08	-	-	-	-	-	2	3.92	455.00	1020.00	1.08
8	1	4.76	496.00	1460.00	1.20	7	23.33	540.86	1702.86	1.08	8	15.69	535.25	1672.50	1.10
9	2	9.52	490.00	1190.00	1.01	4	13.33	575.00	1980.00	1.04	6	11.76	546.67	1716.67	1.03
10	1	4.76	520.00	1700.00	1.21	3	10.00	560.67	1940.00	1.10	4	7.84	550.50	1880.00	1.13
11	-	-	-	-	-	3	10.00	573.33	2000.00	1.06	3	5.88	573.33	2000.00	1.06
12	1	4.76	574.00	2200.00	1.16	-	-	-	-	-	1	1.96	574.00	2200.00	1.16
13	1	4.76	500.00	1380.00	1.10	-	-	-	-	-	1	1.96	500.00	1380.00	1.10
15	-	-	-	-	-	3	10.00	618.00	2486.67	1.05	3	5.88	618.00	2486.67	1.05
17	-	-	-	-	-	1	3.33	706.00	4060.00	1.15	1	1.96	706.00	4060.00	1.15
18	1	4.76	538.00	1800.00	1.16	1	3.33	680.00	3200.00	1.02	2	3.92	609.00	2500.00	1.09
19	6	28.57	547.67	1840.00	1.12	2	6.67	634.00	2400.00	0.93	8	15.69	569.25	1980.00	1.07
21	1	4.76	580.00	2020.00	1.04	1	3.33	630.00	2240.00	0.90	2	3.92	605.00	2130.00	0.97

Appendix 28. Age-specific mean lengths, weights and condition factors for Second Cranberry Lake walleye, 1980.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
3	3	13.64	281.33	256.67	1.26	1	5.56	306.00	300.00	1.05	4	10.00	287.50	267.50	1.21
5	5	22.73	431.60	804.00	1.00	-	-	-	-	-	5	12.50	431.60	804.00	1.00
6	2	9.09	429.00	855.00	1.03	1	5.56	570.00	1300.00	0.70	3	7.50	476.00	1003.33	0.92
7	3	13.64	469.33	1153.33	1.10	1	5.56	512.00	1460.00	1.09	4	10.00	480.00	1230.00	1.10
8	4	18.18	488.50	1252.50	1.06	5	27.78	536.40	1752.00	1.13	9	22.50	515.11	1530.00	1.10
9	1	4.55	472.00	1140.00	1.08	5	27.78	550.40	1820.00	1.09	6	15.00	537.33	1706.67	1.09
10	1	4.55	526.00	1640.00	1.13	3	16.67	561.33	2013.33	1.13	4	10.00	552.50	1920.00	1.13
12	1	4.55	552.00	1960.00	1.17	-	-	-	-	-	1	2.50	552.00	1960.00	1.17
13	-	-	-	-	-	1	5.56	626.00	2580.00	1.05	1	2.50	626.00	2580.00	1.05
16	-	-	-	-	-	1	5.56	650.00	3180.00	1.16	1	2.50	650.00	3180.00	1.16
18	2	9.09	545.00	1875.00	1.15						2	5.00	545.00	1875.00	1.15

Appendix 29. Age-specific mean lengths, weights and condition factors for Third Cranberry Lake walleye, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
1	2	11.11	207.00	100.00	1.13	-	-	-	-	-	2	4.65	207.00	100.00	1.13
4	3	16.67	387.33	653.33	1.12	2	8.00	415.00	865.00	1.15	5	11.63	398.40	738.00	1.13
5	4	22.22	419.50	797.50	1.08	4	16.00	450.50	1083.75	1.17	8	18.60	435.00	940.63	1.12
6	1	5.56	460.00	1000.00	1.03	8	32.00	499.25	1426.25	1.13	9	20.93	494.89	1378.89	1.12
7	1	5.56	444.00	1030.00	1.18	1	4.00	512.00	1560.00	1.16	2	4.65	478.00	1295.00	1.17
8	2	11.11	507.00	1475.00	1.13	3	12.00	494.00	1313.33	1.09	5	11.63	499.20	1378.00	1.11
9	-	-	-	-	-	2	8.00	507.00	1410.00	1.09	2	4.65	507.00	1410.00	1.09
10	1	5.56	522.00	1760.00	1.24	2	8.00	501.00	1510.00	1.16	3	6.98	508.00	1593.33	1.19
11	-	-	-	-	-	1	4.00	482.00	1160.00	1.04	1	2.33	482.00	1160.00	1.04
13	-	-	-	-	-	1	4.00	536.00	1560.00	1.01	1	2.33	536.00	1560.00	1.01
14	1	5.56	556.00	2200.00	1.28	-	-	-	-	-	1	2.33	556.00	2200.00	1.28
15	1	5.56	518.00	1700.00	1.22	-	-	-	-	-	1	2.33	518.00	1700.00	1.22
19	2	11.11	566.00	1870.00	1.03	1	4.00	680.00	3360.00	1.07	3	6.98	604.00	2366.67	1.04

Appendix 30. Age-specific mean lengths, weights and condition factors for Elbow Lake walleye, 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
1	2	2.60	192.00	70.00	0.98	-	-	-	-	-	2	0.78	192.00	70.00	0.98
2	2	2.60	215.00	90.00	0.80	3	1.69	207.33	80.00	0.89	5	1.97	210.40	84.00	0.85
3	1	1.30	282.00	260.00	1.16	1	0.56	290.00	160.00	0.66	2	0.79	286.00	210.00	0.91
4	5	6.49	274.00	228.00	1.10	9	5.08	253.56	173.33	1.09	14	5.51	260.86	192.86	1.09
5	3	3.90	291.33	293.33	1.19	9	5.08	352.22	536.67	1.09	12	4.72	337.00	475.83	1.11
6	17	22.08	352.94	460.00	1.03	26	14.69	356.77	508.85	1.10	43	16.93	355.26	489.53	1.07
7	6	7.79	364.00	528.33	1.05	28	15.82	391.86	686.43	1.12	34	13.39	386.94	658.53	1.11
8	6	7.79	382.33	620.00	1.10	18	10.17	416.00	787.78	1.09	24	9.45	407.50	745.83	1.09
9	10	12.99	377.20	607.00	1.09	21	11.86	425.90	848.10	1.09	31	12.21	410.19	770.32	1.09
10	1	1.30	408.00	720.00	1.06	3	1.69	452.33	1106.67	1.19	4	1.57	441.25	1010.00	1.16
11	5	6.49	423.20	852.00	1.12	20	11.30	486.90	1282.50	1.10	25	9.84	474.16	1196.40	1.11
12	1	1.30	448.00	840.00	0.93	4	2.26	480.00	1235.00	1.12	5	1.97	473.60	1156.00	1.08
13	3	3.90	449.33	906.67	0.99	3	1.69	462.67	1293.33	1.10	6	2.36	456.00	1100.00	1.04
14	4	5.19	482.50	955.00	0.91	10	5.65	520.00	1538.00	1.06	14	5.51	509.86	1371.43	1.02
15	8	10.39	430.75	913.75	1.11	15	8.47	499.20	1367.73	1.07	23	9.05	475.39	1209.83	1.08
16	1	1.30	432.00	990.00	1.23	1	0.56	510.00	1380.00	1.04	2	0.79	471.00	1185.00	1.14
17	-	-	-	-	-	1	0.56	672.00	2740.00	0.90	1	0.39	672.00	2740.00	0.90
18	1	1.30	460.00	1080.00	1.11	2	1.13	467.00	1140.00	1.13	3	1.18	464.67	1120.00	1.12
19	1	1.30	424.00	880.00	1.15	-	-	-	-	-	1	0.39	424.00	880.00	1.15
20						1	0.56	656.00	2920.00	1.03	1	0.39	656.00	2920.00	1.03
21						1	0.56	504.00	1620.00	1.27	1	0.39	504.00	1620.00	1.27
24						1	0.56	600.00	2120.00	0.98	1	0.39	600.00	2120.00	0.98

Appendix 31. Maturity schedule for Simonhouse Lake walleye, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
3	5		2		7	
4	5		12	3	17	3
5	2	10	2	4	4	14
6		4	1	4	1	8
7				3		3
8	1	7	2	9	3	16
9	2	5		6	2	11
10	3	5		15	3	20
11		4		4		8
12		1		2		3
13		2		1		3
14		2				2
17		3				3
18				4		4
19				2		2
20		2		1		3
21		1				1
22		1		1		2
27		1				1

Appendix 32. Maturity schedule for First Cranberry Lake walleye, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
4	2	1	2		4	1
5	2			3	2	3
6		2				2
8		1		7		8
9		2		4		6
10		1		3		4
11				3		3
12		1				1
13		1				1
15				3		3
17				1		1
18		1		1		2
19		6		2		8
21		1		1		2

Appendix 33. Maturity schedule for Second Cranberry Lake walleye, 1980.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
3	3		1		4	
5	3	2			3	2
6	1	1		1	1	2
7	1	2		1		3
8		4		5		9
9		1		5		6
10		1		3		4
12		1				1
13				1		1
16				1		1
18		2				2

Appendix 34. Maturity schedule for Third Cranberry Lake walleye, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
1	2				2	
4	3		1	1	4	1
5	1	3	1	3	2	6
6		1		8		9
7		1		1		2
8		2		3		5
9				2		2
10		1		2		3
11				1		1
13				1		1
14		1				1
15		1				1
19		2		1		3

Appendix 35. Maturity schedule for Elbow Lake walleye, 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
1	2				2	
2	2		3		5	
3	1		1		2	
4	5		9		14	
5	3		6	3	9	3
6	9	8	18	8	27	16
7	3	3	14	14	17	17
8	1	5	5	13	6	18
9	1	9	1	20	2	29
10		1		3		4
11		5		20		25
12		1		4		5
13		3		3		6
14		4		10		14
15		8		15		23
16		1		1		2
17				1		1
18		1		2		3
19		1				1
20				1		1
21				1		1
24				1		1

Appendix 36. Age-specific mean lengths, weights, and condition factors for Simonhouse Lake pike, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
1	1	0.69	198.00	60.00	0.77	1	0.45	226.00	60.00	0.52	2	0.54	212.00	60.00	0.65
2	3	2.07	260.00	153.33	0.66	5	2.23	320.40	336.00	0.92	8	2.17	297.75	267.50	0.82
3	8	5.52	395.50	451.25	0.72	7	3.13	403.43	514.29	0.77	15	4.07	399.20	460.67	0.74
4	22	15.17	467.73	877.27	0.84	17	7.59	469.94	830.59	0.80	39	10.57	468.69	856.92	0.82
5	22	15.17	527.82	1097.27	0.72	36	16.07	531.86	1185.56	0.76	58	15.72	530.33	1152.07	0.75
6	32	22.07	569.00	1341.25	0.71	38	16.96	598.97	1573.68	0.71	70	18.97	585.27	1467.43	0.71
7	30	20.69	604.60	1593.33	0.70	46	20.54	635.13	1923.04	0.72	76	20.60	623.08	1792.89	0.72
8	12	8.28	661.83	2120.00	0.71	37	16.52	695.24	2541.08	0.73	49	13.28	687.06	2437.96	0.72
9	8	5.52	695.00	2645.00	0.77	18	8.04	716.89	3076.67	0.83	26	7.05	710.15	2943.85	0.81
10	4	2.76	773.00	3685.00	0.76	9	4.02	732.00	3480.00	0.87	13	3.52	744.62	3543.08	0.83
11	2	1.38	815.00	4640.00	0.86	5	2.23	884.00	5836.00	0.78	7	1.90	864.29	5494.29	0.81
12	1	0.69	828.00	5720.00	1.01	2	0.89	952.00	7190.00	0.83	3	0.81	910.67	6700.00	0.89
13						3	1.34	997.33	7886.67	0.79	3	0.81	997.33	7886.67	0.79

Appendix 37. Age-specific mean lengths, weights and condition factors for First Cranberry Lake pike, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
2	1	1.92	420.00	660.00	0.89	-	-	-	-	-	1	1.18	420.00	660.00	0.89
3	2	3.85	475.00	950.00	0.90	2	6.06	509.00	900.00	0.70	4	4.71	492.00	925.00	0.80
4	9	17.31	525.78	1191.11	0.84	7	21.21	574.00	1411.43	0.74	16	18.82	546.88	1287.50	0.80
5	18	34.62	592.22	1687.78	0.80	11	33.33	602.36	1609.09	0.73	29	34.12	596.07	1657.93	0.77
6	13	25.00	601.69	1715.38	0.77	7	21.21	662.00	2140.00	0.72	20	23.53	622.80	1864.00	0.75
7	3	5.77	632.00	2026.67	0.80	2	6.06	651.00	1890.00	0.69	5	5.88	639.60	1972.00	0.76
8	3	5.77	715.33	2913.33	0.77	2	6.06	678.00	2860.00	0.90	5	5.88	700.40	2892.00	0.82
9	-	-	-	-	-	1	3.03	928.00	6820.00	0.85	1	1.18	928.00	6820.00	0.85
10	3	5.77	733.33	3146.67	0.79	-	-	-	-	-	3	3.53	733.33	3146.67	0.79
11	-	-	-	-	-	1	3.03	860.00	5640.00	0.89	1	1.18	860.00	5640.00	0.89

Appendix 38. Age-specific mean lengths, weights and condition factors for Second Cranberry Lake pike, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
3	-	-	-	-	-	2	28.57	367.00	310.00	0.63	2	12.50	367.00	310.00	0.63
4	2	22.22	478.00	760.00	0.70	-	-	-	-	-	2	12.50	478.00	760.00	0.70
5	3	33.33	568.00	1326.67	0.71	1	14.29	536.00	1140.00	0.74	4	25.00	560.00	1280.00	0.72
6	2	22.22	563.00	1260.00	0.71	1	14.29	594.00	1460.00	0.70	3	18.75	573.33	1326.67	0.71
7	1	11.11	738.00	3080.00	0.77	1	14.29	682.00	2560.00	0.81	2	12.50	710.00	2820.00	0.79
8	-	-	-	-	-	2	28.57	695.00	1975.00	0.59	2	12.50	695.00	1975.00	0.59
9	1	11.11	622.00	1800.00	0.75						1	6.25	622.00	1800.00	0.75

Appendix 39. Age-specific mean lengths, weights and condition factors for Third Cranberry Lake pike, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
2	4	12.12	324.50	260.00	0.75	2	6.67	361.00	370.00	0.79	6	9.52	336.67	296.67	0.76
3	5	15.15	389.60	468.00	0.79	7	23.33	420.29	565.71	0.74	12	19.05	407.50	525.00	0.76
4	9	27.27	520.67	1160.00	0.81	10	33.33	551.60	1318.00	0.76	19	30.16	536.95	1243.16	0.78
5	4	12.12	574.50	1305.00	0.70	3	10.00	692.00	2026.67	0.61	7	11.11	624.86	1614.29	0.66
6	5	15.15	601.20	1484.00	0.69	4	13.33	668.50	2020.00	0.68	9	14.29	631.11	1722.22	0.68
7	1	3.03	670.00	2300.00	0.76	2	6.67	580.00	1600.00	0.73	3	4.76	610.00	1833.33	0.74
8	4	12.12	729.00	3175.00	0.78	1	3.33	784.00	3480.00	0.72	5	7.94	740.00	3236.00	0.76
12	1	3.03	692.00	2094.00	0.63	-	-	-	-	-	1	1.59	692.00	2094.00	0.63
13						1	3.33	858.00	4560.00	0.72	1	1.59	858.00	4560.00	0.72

Appendix 40. Age-specific mean lengths, weights and condition factors for Elbow Lake pike, 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
2	9	6.47	318.89	255.56	0.78	4	2.76	316.50	260.00	0.81	14	4.89	320.43	258.57	0.78
3	10	7.19	339.80	308.00	0.73	5	3.45	338.40	308.00	0.76	15	5.24	339.33	308.00	0.74
4	20	14.39	451.70	699.00	0.74	19	13.10	479.68	758.21	0.67	39	13.64	465.33	727.85	0.71
5	23	16.55	512.61	977.39	0.70	23	15.86	538.09	1093.48	0.69	47	16.43	521.91	1021.06	0.69
6	32	23.02	565.44	1392.81	0.74	32	22.07	593.25	1532.19	0.71	64	22.38	579.34	1462.50	0.73
7	24	17.27	597.21	1603.33	0.73	25	17.24	633.24	1823.60	0.71	50	17.48	616.00	1722.80	0.72
8	13	9.35	669.54	2396.92	0.77	18	12.41	696.44	2503.33	0.71	31	10.84	685.16	2458.71	0.73
9	4	2.88	701.00	2910.00	0.81	11	7.59	698.91	2832.73	0.76	15	5.24	699.47	2853.33	0.77
10	1	0.72	582.00	1440.00	0.73	6	4.14	697.67	2903.33	0.82	7	2.45	681.14	2694.29	0.81
11	1	0.72	780.00	3300.00	0.70	1	0.69	714.00	2520.00	0.69	2	0.70	747.00	2910.00	0.70
12	1	0.72	826.00	4400.00	0.78	-	-	-	-	-	1	0.35	826.00	4400.00	0.78
13	1	0.72	762.00	3540.00	0.80	-	-	-	-	-	1	0.35	762.00	3540.00	0.80

Appendix 41. Maturity schedule for Simonhouse Lake pike, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
1	1		1		2	
2	3		5		8	
3	4	4	4	3	8	7
4	9	13	8	9	17	22
5	3	19	7	29	10	48
6	5	27	3	35	8	62
7	1	29	2	44	3	73
8		12	3	34	3	46
9		8		18		26
10		4		9		13
11		2		5		7
12		1		2		3
13				3		3

Appendix 42. Maturity schedule for First Cranberry Lake pike, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
2		1			1	
3		2		2		4
4		9		7		16
5		18	2	9	2	27
6	1	12		7	1	19
7		3		2		5
8		3		2		5
9				1		1
10		3				3
11				1		1

Appendix 43. Maturity schedule for Second Cranberry Lake pike, 1980.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
3			2		2	
4	1	1			1	1
5		3	1		1	3
6		2		1		3
7		1		1		2
8				1		1
9		1				1

Appendix 44. Maturity schedule for Third Cranberry Lake pike, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
2	4		2		6	
3	1	4	7		8	4
4		9	3	7	3	16
5		4		3		7
6		5		4		9
7		1		2		3
8		4		1		5
12		1				1
13				1		1

Appendix 45. Maturity schedule for Elbow Lake pike, 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
2	9		3	1	12	1
3	9	1	4	1	13	2
4	2	18	5	14	7	32
5	3	20	3	20	6	40
6	2	30	3	29	5	59
7	1	23	2	23	3	46
8		13	1	17	1	30
9		4	1	10	1	14
10		1		6		7
11		1		1		2
12		1				1
13		1				1

Appendix 46. Age-specific mean lengths, weights and condition factors for Simonhouse Lake whitefish, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
5						1	1.03	272.00	260.00	1.29	1	0.63	272.00	260.00	1.29
6						1	1.03	300.00	400.00	1.48	1	0.63	300.00	400.00	1.48
8	1	1.61	362.00	640.00	1.35	3	3.09	376.67	840.00	1.46	4	2.52	373.00	790.00	1.43
9	1	1.61	402.00	1020.00	1.57	7	7.22	360.29	677.14	1.36	8	5.03	365.50	720.00	1.39
10	5	8.06	368.40	732.00	1.42	3	3.09	379.33	826.67	1.49	8	5.03	372.50	767.50	1.45
11	6	9.68	385.00	863.33	1.49	8	8.25	407.75	992.50	1.47	14	8.81	398.00	937.14	1.48
12	6	9.68	413.33	1046.67	1.46	7	7.22	413.71	1110.00	1.52	13	8.18	413.54	1080.77	1.49
13	4	6.45	404.00	950.00	1.44	6	6.19	423.00	1073.33	1.42	10	6.29	415.40	1024.00	1.43
14	7	11.29	424.86	1131.43	1.47	9	9.28	412.00	1055.56	1.50	16	10.06	417.63	1088.75	1.49
15	5	8.06	415.60	1036.00	1.43	9	9.28	431.56	1116.67	1.39	14	8.81	425.86	1087.86	1.40
16	2	3.23	411.00	1050.00	1.52	11	11.34	427.09	1080.00	1.38	13	8.18	424.62	1075.38	1.40
17	5	8.06	424.00	1080.00	1.41	8	8.25	441.50	1187.50	1.38	13	8.18	434.77	1146.15	1.39
18	6	9.68	444.00	1166.67	1.33	12	12.37	432.58	1068.33	1.31	18	11.32	436.39	1101.11	1.32
19	6	9.68	437.33	1076.76	1.28	2	2.06	441.00	1180.00	1.37	8	5.03	438.25	1102.50	1.30
20	1	1.61	440.00	1200.00	1.41	4	4.12	443.00	1185.00	1.36	5	3.14	442.40	1188.00	1.37
21	3	4.84	459.33	1440.00	1.46	2	2.06	451.00	1110.00	1.21	5	3.14	456.00	1308.00	1.36
22	3	4.84	428.00	940.00	1.20	1	1.03	424.00	1240.00	1.63	4	2.52	427.00	1015.00	1.31
23	1	1.61	490.00	1400.00	1.19	-	-	-	-	-	1	0.63	490.00	1400.00	1.19
26						1	1.03	494.00	1120.00	0.93	1	0.63	494.00	1120.00	0.93
28						2	2.06	459.00	1670.00	1.73	2	1.26	459.00	1670.00	1.73

Appendix 47. Age-specific mean lengths, weights and condition factors for First Cranberry Lake whitefish, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
8	1	10.00	314.00	360.00	1.16	-	-	-	-	-	1	6.25	314.00	360.00	1.16
9	-	-	-	-	-	2	33.33	326.00	530.00	1.53	2	12.50	326.00	530.00	1.53
10	1	10.00	330.00	500.00	1.39	-	-	-	-	-	1	6.25	330.00	500.00	1.39
12	2	20.00	395.00	870.00	1.34	-	-	-	-	-	2	12.50	395.00	870.00	1.34
13	-	-	-	-	-	1	16.67	460.00	1300.00	1.34	1	6.25	460.00	1300.00	1.34
15	1	10.00	420.00	1020.00	1.38	1	16.67	408.00	800.00	1.18	2	12.50	414.00	910.00	1.28
16	2	20.00	416.00	1110.00	1.54	1	16.67	452.00	1100.00	1.19	3	18.75	428.00	1106.67	1.42
18	1	10.00	426.00	1000.00	1.29	-	-	-	-	-	1	6.25	426.00	1000.00	1.29
19	1	10.00	446.00	1120.00	1.26	-	-	-	-	-	1	6.25	446.00	1120.00	1.26
23	1	10.00	450.00	1020.00	1.12	-	-	-	-	-	1	6.25	450.00	1020.00	1.12
24						1	16.67	408.00	1000.00	1.47	1	6.25	408.00	1000.00	1.47

Appendix 48. Age-specific mean lengths, weights and condition factors for Second Cranberry Lake whitefish, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
3	2	4.44	214.00	110.00	1.14	1	1.61	325.00	500.00	1.15	3	2.80	260.00	240.00	1.14
5	1	2.22	252.00	200.00	1.25	2	3.23	258.00	210.00	1.22	3	2.80	256.00	206.67	1.23
6	-	-	-	-	-	3	4.84	304.67	343.33	1.20	3	2.80	304.67	343.33	1.20
7	3	6.67	265.33	233.33	1.23	3	4.84	300.00	313.33	1.14	6	5.61	282.67	273.33	1.19
8	2	4.44	365.00	700.00	1.34	6	9.68	315.33	395.00	1.16	8	7.48	327.75	471.25	1.20
9	3	6.67	336.00	446.67	1.18	4	6.45	360.50	612.50	1.26	7	6.54	350.00	541.43	1.23
10	4	8.89	369.50	702.50	1.35	2	3.23	343.00	470.00	1.04	6	5.61	360.67	625.00	1.25
11	3	6.67	401.33	830.00	1.23	7	11.29	370.86	674.29	1.19	10	9.35	380.00	721.00	1.20
12	2	4.44	441.00	1105.00	1.30	7	11.29	411.43	887.14	1.25	9	8.41	418.00	935.56	1.26
13	5	11.11	394.00	852.00	1.36	3	4.84	400.00	973.33	1.40	8	7.48	396.25	897.50	1.38
14	2	4.44	396.00	950.00	1.53	5	8.06	385.20	776.00	1.31	7	6.54	388.29	825.71	1.38
15	2	4.44	401.00	920.00	1.42	3	4.84	396.00	830.00	1.32	5	4.67	398.00	866.00	1.36
16	2	4.44	406.00	860.00	1.28	3	4.84	411.33	933.33	1.31	5	4.67	409.20	904.00	1.29
17	2	4.44	391.00	790.00	1.31	2	3.23	406.00	850.00	1.27	4	3.74	398.50	820.00	1.29
18	1	2.22	430.00	1200.00	1.51	3	4.84	420.67	913.33	1.21	4	3.74	423.00	985.00	1.29
19	2	4.44	384.00	720.00	1.26	2	3.23	428.00	960.00	1.22	4	3.74	406.00	840.00	1.24
20	4	8.89	451.00	1175.00	1.26	1	1.61	492.00	1540.00	1.29	5	4.67	459.20	1248.00	1.26
21	1	2.22	436.00	1000.00	1.21	1	1.61	422.00	1000.00	1.33	2	1.87	429.00	1000.00	1.27
22	1	2.22	426.00	1030.00	1.33	1	1.61	430.00	1000.00	1.26	2	1.87	428.00	1015.00	1.30
23	-	-	-	-	-	1	1.61	470.00	1000.00	0.96	1	0.93	470.00	1000.00	0.96
25	1	2.22	458.00	1300.00	1.35	1	1.61	440.00	900.00	1.06	2	1.87	449.00	1100.00	1.21
26	-	-	-	-	-	1	1.61	452.00	1200.00	1.30	1	0.93	452.00	1200.00	1.30
27	2	4.44	457.00	1245.00	1.29	-	-	-	-	-	2	1.87	457.00	1245.00	1.29

Appendix 49. Age-specific mean lengths, weights and condition factors for Third Cranberry Lake whitefish, 1980 and 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
5	-	-	-	-	-	1	1.33	300.00	380.00	1.41	1	0.72	300.00	380.00	1.41
6	1	1.59	378.00	680.00	1.26	2	2.67	320.00	420.00	1.28	3	2.17	339.33	506.67	1.27
7	2	3.17	345.00	570.00	1.39	4	5.33	315.50	425.00	1.35	6	4.35	325.33	473.33	1.36
8	-	-	-	-	-	4	5.33	348.50	530.00	1.26	4	2.90	348.50	530.00	1.26
9	-	-	-	-	-	2	2.67	314.00	430.00	1.39	2	1.45	314.00	430.00	1.39
10	4	6.35	334.50	525.00	1.40	1	1.33	360.00	620.00	1.33	5	3.62	339.60	544.00	1.38
11	5	7.94	354.40	590.00	1.32	5	6.67	376.00	674.00	1.23	10	7.25	365.20	632.00	1.28
12	11	17.46	360.91	631.82	1.34	1	1.33	368.00	640.00	1.28	12	8.70	361.50	632.50	1.34
13	2	3.17	378.00	740.00	1.38	10	13.33	365.60	680.00	1.39	12	8.70	367.67	690.00	1.39
14	4	6.35	380.50	755.00	1.37	7	9.33	363.43	672.29	1.39	11	7.97	369.64	702.36	1.38
15	2	3.17	360.00	640.00	1.37	3	4.00	401.00	806.67	1.25	5	3.62	384.60	740.00	1.30
16	4	6.35	362.00	640.00	1.35	4	5.33	392.00	810.00	1.34	8	5.80	377.00	725.00	1.34
17	4	6.35	367.00	685.00	1.38	4	5.33	393.50	830.00	1.33	8	5.80	380.25	757.50	1.36
18	7	11.11	390.00	788.57	1.34	5	6.67	396.40	796.00	1.26	12	8.70	392.67	791.67	1.30
19	5	7.94	386.00	740.00	1.30	6	8.00	389.00	770.00	1.31	11	7.97	387.64	756.36	1.30
20	5	4.76	406.67	920.00	1.33	3	4.00	396.00	806.67	1.28	6	4.35	401.33	863.33	1.31
21	4	6.35	391.50	780.00	1.31	4	5.33	395.00	750.00	1.21	8	5.80	393.25	765.00	1.26
22	1	1.59	412.00	940.00	1.34	4	5.33	409.50	930.00	1.33	5	3.62	410.00	932.00	1.33
23	-	-	-	-	-	3	4.00	398.67	826.67	1.30	3	2.17	398.67	826.67	1.30
24	2	3.17	412.00	670.00	0.96	2	2.67	411.00	890.00	1.28	4	2.90	411.50	780.00	1.12
25	2	3.17	419.00	920.00	1.26	-	-	-	-	-	2	1.45	419.00	920.00	1.26

Appendix 50. Age-specific mean lengths, weights and condition factors for Elbow Lake whitefish, 1981.

Age	Males					Females					Both Sexes				
	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
3	1	1.85	368.00	680.00	1.36	-	-	-	-	-	1	0.84	368.00	680.00	1.36
5	1	1.85	230.00	180.00	1.48	1	1.56	248.00	200.00	1.31	2	1.68	239.00	190.00	1.40
6	-	-	-	-	-	2	3.12	292.00	355.00	1.43	2	1.68	292.00	355.00	1.43
7	3	5.56	302.67	400.00	1.47	1	1.56	300.00	370.00	1.37	5	4.20	305.60	410.00	1.41
9	7	12.96	350.14	634.29	1.47	9	14.06	329.33	308.89	1.40	16	13.44	338.44	563.75	1.43
10	4	7.41	346.50	602.50	1.44	11	17.19	346.73	654.55	1.56	15	12.60	346.67	640.67	1.53
11	4	7.41	347.50	612.50	1.46	4	6.25	362.50	705.00	1.46	8	6.72	355.00	658.75	1.46
12	4	7.41	383.50	827.50	1.46	3	4.69	361.33	676.67	1.43	7	5.88	374.00	762.86	1.45
13	8	14.81	369.00	733.75	1.44	5	7.81	376.80	780.00	1.45	13	10.92	372.00	751.54	1.45
14	6	11.11	373.67	780.00	1.48	7	10.94	372.00	748.57	1.44	13	10.92	372.77	763.08	1.46
15	1	1.85	408.00	1170.00	1.72	4	6.25	386.00	835.00	1.45	5	4.20	390.40	902.00	1.50
16	3	5.56	370.67	766.67	1.43	3	4.69	376.67	793.33	1.48	6	5.04	373.67	780.00	1.46
17	1	1.85	420.00	980.00	1.32	1	1.56	294.00	340.00	1.34	2	1.68	357.00	660.00	1.33
19	2	3.70	353.00	620.00	1.41	6	9.37	395.67	881.67	1.39	8	6.72	385.00	816.25	1.39
20	3	5.56	404.00	960.00	1.45	1	1.56	402.00	820.00	1.26	4	3.36	403.50	925.00	1.41
21	1	1.85	400.00	1200.00	1.88	2	3.12	397.00	840.00	1.34	3	2.52	398.00	960.00	1.52
22	1	1.85	432.00	1160.00	1.44	-	-	-	-	-	1	0.84	432.00	1160.00	1.44
23	1	1.85	438.00	1280.00	1.52	1	1.56	406.00	880.00	1.31	2	1.68	422.00	1080.00	1.42
24	1	1.85	432.00	1120.00	1.39	1	1.56	406.00	900.00	1.34	2	1.68	419.00	1010.00	1.37
25	2	3.70	417.00	940.00	1.29	2	3.12	414.00	950.00	1.31	4	3.36	415.50	945.00	1.30

Appendix 51. Maturity schedule for Simonhouse Lake whitefish, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
5			1		1	
6				1		1
8	1		1	2	2	2
9	1			7	1	7
10	2	3		3	2	6
11		7		8		15
12		6		7		13
13		4		6		10
14		7		9		16
15		5		9		14
16		2	2	9	2	11
17		5		8		13
18		6	1	11	1	17
19		6		2		8
20		1		4		5
21		3		2		5
22		3		1		4
23		1				1
26			1		1	
28				2		2

Appendix 52. Maturity schedule for First Cranberry Lake whitefish, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
8	1				1	
9			1	1	1	1
10	1				1	
12	1	1			1	1
13				1		1
15		1		1		2
16		2		1		3
18		1				1
19		1				1
23		1				1
24				1		1

Appendix 53. Maturity schedule for Second Cranberry Lake whitefish, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
3	2		1		3	
5	1		2		3	
6			2	1	2	1
7	3		3		6	
8	1	1	4	2	5	3
9	3		1	3	4	3
10		4	1	1	1	5
11		3	2	5	2	8
12		2		7		9
13		5	1	2	1	7
14		2		5		7
15		2	2	1	2	3
16	1	1		3	1	4
17		2		2		4
18		1		3		4
19		2		2		4
20	1	3		1	1	4
21		1		1		2
22		1		1		2
23				1		1
25		1		1		2
26				1		1
27		2				2

Appendix 54. Maturity schedule for Third Cranberry Lake whitefish, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
5			1		1	
6		1	2		2	1
7		2	4		4	2
8			3	1	3	1
9				2		2
10		4		1		5
11		5	1	4	1	9
12	1	10	1		2	10
13		2		10		12
14		4		7		11
15		2		3		5
16		4		4		8
17		4		4		8
18		7		5		12
19		5		6		11
20		3		3		6
21		4		4		8
22		1		4		5
23				3		3
24		2		2		4
25		2				2

Appendix 55. Maturity schedule for Elbow Lake whitefish, 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
3	1				1	
5	1		1		2	
6				2		2
7	2	1		1	2	2
9	1	6	1	8	2	14
10	2	2		11	2	13
11	1	3		4	1	7
12	1	3		3	1	6
13		8		5		13
14	1	5	1	6	2	11
15		1		4		5
16	1	2		3	1	5
17		1		1		2
19		2		6		8
20		3		1		4
21		1		2		3
22		1				1
23		1		1		2
24		1		1		2
25	1	1		2	1	3

Appendix 56. Age-specific mean lengths, weights and condition factors for lake trout from the study lakes, 1980 and 1981.

Lake	Age	Males					Females					Both Sexes				
		Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor	Number caught	Frequency (%)	Mean length (mm)	Mean weight (g)	Mean cond. factor
First Cranberry	25						1	100.00	620.00	2620.00	1.10	1	100.00	620.00	2620.00	1.10
Second Cranberry	4	3	23.08	220.67	106.67	0.95	-	-	-	-	-	3	15.00	220.67	106.67	0.95
	5	-	-	-	-	-	1	14.29	262.00	180.00	1.00	1	5.00	262.00	180.00	1.00
	6	1	7.69	284.00	220.00	0.96	1	14.29	258.00	190.00	1.11	2	10.00	271.00	205.00	1.04
	7	1	7.69	354.00	420.00	0.95	2	28.57	375.00	750.00	1.05	3	15.00	368.00	640.00	1.02
	9	-	-	-	-	-	2	28.57	322.00	360.00	1.02	2	10.00	322.00	360.00	1.02
	10	1	7.69	504.00	1600.00	1.25						1	5.00	504.00	1600.00	1.25
	12	1	7.69	620.00	2600.00	1.09						1	5.00	620.00	2600.00	1.09
	14	1	7.69	754.00	5800.00	1.35						1	5.00	754.00	5800.00	1.35
	16	1	7.69	732.00	5440.00	1.39						1	5.00	732.00	5440.00	1.39
	17	1	7.69	628.00	3700.00	1.49						1	5.00	628.00	3700.00	1.49
	18	1	7.69	728.00	5420.00	1.40						1	5.00	728.00	5420.00	1.40
	19	-	-	-	-	-	1	14.29	778.00	5920.00	1.26	1	5.00	778.00	5920.00	1.26
	21	1	7.69	788.00	7300.00	1.49						1	5.00	788.00	7300.00	1.49
	25	1	7.69	846.00	8560.00	1.41						1	5.00	846.00	8560.00	1.41
Third Cranberry	19						1	33.33	670.00	4900.00	1.63	1	33.33	670.00	4900.00	1.63
	22						1	33.33	746.00	6640.00	1.60	1	33.33	746.00	6640.00	1.60
	28						1	33.33	894.00	9500.00	1.33	1	33.33	894.00	9500.00	1.33
Elbow	-						1	100.00	616.00	3460.00	-	1	100.00	616.00	3460.00	-

Appendix 57. Maturity schedule for lake trout from Second Cranberry Lake, 1980 and 1981.

Age (yrs)	Male		Female		Both	
	Immature	Mature	Immature	Mature	Immature	Mature
4	3				3	
5			1		1	
6	1		1		2	
7	1		1	1	2	1
9			2		2	
10		1				1
12		1				1
14		1				1
16		1				1
17		1				1
18		1				1
19				1		1
21		1				1
25		1				1

Appendix 58. Percent composition and catch per unit of effort (number .91 m $^{-1}$ night $^{-1}$, in parentheses) for fish caught in the Cranberry lakes on August 11 to 15, 1975 and August 3 to 7, 1976.

Species	First Cranberry			Second Cranberry			Third Cranberry		
	1975	1976	Mean	1975	1976	Mean	1975	1976	Mean
Whitefish		0.4(0.1)	0.3(0.07)	35.4(13.4)	7.9(1.8)	21.2(5.9)	2.4(0.6)	17.6(10.2)	13.5(5.8)
Cisco	21.2(4.2)	14.5(4.3)	16.3(4.3)	10.6(4.0)	30.5(6.9)	20.9(5.9)	14.2(3.6)	38.9(22.5)	32.3(13.9)
Lake Trout				2.6(1.0)	1.5(0.3)	2.0(0.6)			
Pike	4.0(0.8)	7.4(2.2)	6.5(1.7)		3.0(0.7)	1.5(0.4)	5.5(1.4)	2.3(1.3)	3.2(1.4)
Walleye	17.2(3.4)	6.7(2.0)	9.5(2.5)	0.5(0.2)	14.8(3.3)	7.9(2.2)	18.1(4.6)	3.5(2.0)	7.4(3.2)
Yellow Perch		23.0(6.9)	16.8(4.4)					4.9(2.8)	3.6(1.5)
Burbot				18.5(7.0)	2.5(0.6)	10.2(2.9)			
White Sucker	57.6(11.4)	47.9(14.3)	50.5(13.3)	32.3(12.2)	39.9(9.0)	36.2(10.1)	59.8(15.2)	32.8(19.0)	40.1(17.3)
No. of stand. gangs	2	3	5	2	3	5	2	2	4
Total no. of fish	99	269	368	189	203	392	127	347	474

Appendix 59. Evaluation scheme of fishing success based on catch per unit effort (Andrews 1968).

Species	Poor	Fair	Good	Excellent
Pike	0.00-0.06	0.07-0.21	0.22-0.64	0.65----
Walleye	0.00-0.09	0.10-0.24	0.25-0.55	0.56----
Lake Trout	0.00-0.01	0.02-0.04	0.05-0.07	0.08----

Appendix 60. Master angler awards from Simonhouse and the Cranberry lakes, 1960 - 1982.

	Simonhouse		First Cranberry			Second Cranberry			Third Cranberry	
Year	Walleye	Pike	Walleye	Pike	Lake Trout	Walleye	Pike	Lake Trout	Walleye	Pike
1960	1	1		2		1		7		6
1961		2		2			1	2		3
1962										2
1963		1		2				3		
1964				2			1	3		
1965				4			5	6		3
1966				2			2	5		2
1967		1		4			4	3	1	6
1968		3		2		1	2	2	1	7
1969		3		1			1	2		5
1970		4	1	8			3	6		16
1971		3	1	4			2	3	2	41
1972		7		2			3	3	5	46
1973		2		4		1	3	2		7
1974		7	1	2	1	3				3
1975	1	4	4	1			4			2
1976		5	1	4			2	5		1
1977		9						3	1	3
1978		6		1			1	4		1
1979	2		1	3				1		
1980		5						4		
1981	3	11		3		1	1	2	2	2
1982	4	8		3				4		3